Panasonic

PROGRAMMABLE CONTROLLER

FP7 CPU Unit

User's Manual

LAN port communication

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Safety Precautions

Observe the following notices to ensure personal safety or to prevent accidents.
To ensure that you use this product correctly, read this User's Manual thoroughly before use.
Make sure that you fully understand the product and information on safety.
This manual uses two safety flags to indicate different levels of danger.

WARNING

If critical situations that could lead to user's death or serious injury is assumed by mishandling of the product.

-Always take precautions to ensure the overall safety of your system, so that the whole system remains safe in the event of failure of this product or other external factor.
-Do not use this product in areas with inflammable gas. It could lead to an explosion.
-Exposing this product to excessive heat or open flames could cause damage to the lithium battery or other electronic parts.

CAUTION

If critical situations that could lead to user's injury or only property damage is assumed by mishandling of the product.

-To prevent excessive exothermic heat or smoke generation, use this product at the values less than the maximum of the characteristics and performance that are assured in these specifications.
-Do not dismantle or remodel the product. It could cause excessive exothermic heat or smoke generation.
-Do not touch the terminal while turning on electricity. It could lead to an electric shock.
-Use the external devices to function the emergency stop and interlock circuit.
-Connect the wires or connectors securely.
The loose connection could cause excessive exothermic heat or smoke generation.
-Do not allow foreign matters such as liquid, flammable materials, metals to go into the inside of the product. It could cause excessive exothermic heat or smoke generation.
-Do not undertake construction (such as connection and disconnection) while the power supply is on. It could lead to an electric shock.

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PLC_ORG_ET

Introduction

Thank you for buying a Panasonic product. Before you use the product, please carefully read the installation instructions and the users manual, and understand their contents in detail to use the product properly.

Types of Manual

- There are different types of users manual for the FP7 series, as listed below. Please refer to a relevant manual for the unit and purpose of your use.
- The manuals can be downloaded on our website.

Unit name or purpose of use	Manual name	Manual code
FP7 Power Supply Unit	FP7 CPU Unit Users Manual (Hardware)	WUME-FP7CPUH
FP7 CPU Unit		
Instructions for Built-in COM Port FP7 Extension (Communication) Cassette	FP7 CPU Unit Users Manual (COM Port Communication)	WUME- FP7COM
Instructions for Built-in LAN Port	FP7 CPU Unit Users Manual (LAN Port Communication)	WUME-FP7LAN
FP7 Digital Input/Output Unit	FP7 Digital Input/Output Unit Users Manual	WUME-FP7DIO
FP7 Analog Input Unit	FP7 Analog Input Unit Users Manual	WUME-FP7AIH
FP7 Analog Output Unit	FP7 Analog Output Unit Users Manual	WUME-FP7AOH
FP7 Positioning Unit	FP7 Positioning Unit Users Manual	WUME-FP7POSP
PHLS System	PHLS System Users Manual	WUME-PHLS
Programming Software FPWIN GR7	FPWIN GR7 Introduction Guidance	WUME-FPWINGR7

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Communication Functions of CPU Unit

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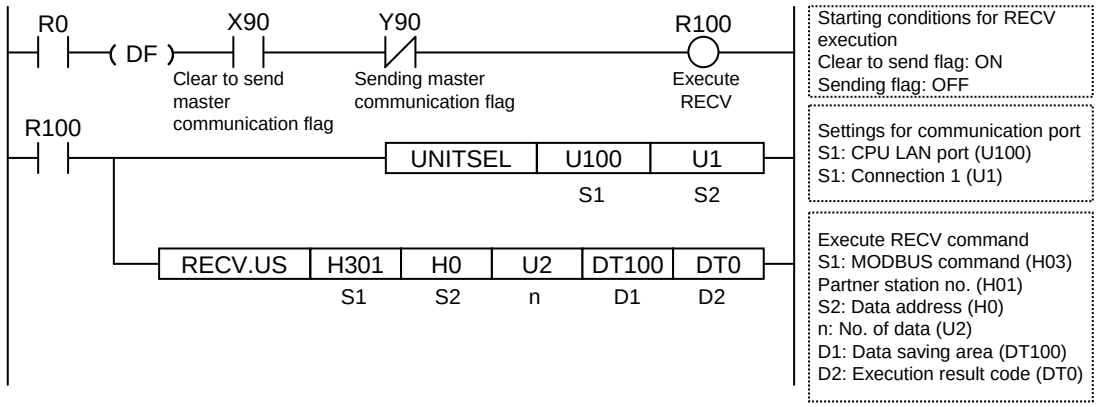
1.1 Communication Ports of CPU Unit

1.1.1 Types and Purposes of Communication Ports

■ **Communication ports of CPU unit**



■ **Functions of Ports**

(1) COM1 and COM2 Ports

Attach a separately sold communication cassette to use these ports. You can select from five types of communication cassettes.

(2) COM0 Port

This is an RS-232C port that is equipped to a standard model of CPU unit. It is equipped with power supply terminals (5V DC and 24V DC) to which a GT series display can be connected.

(3) LAN Port

This is equipped to a standard model of CPU unit. It is used for connection to Ethernet. It can also be connected with a programming tool. The MAC address is printed on the side of the unit. It supports the Ethernet communication interfaces 100BASE-TX and 10BASE-T. 100BASE-TX and 10BASE-T are automatically switched by the auto negotiation function.

(4) USB Port

This is equipped to a standard model of CPU unit. This is used when connecting tool software.

◆ **REFERENCE**

- **For communication using the COM port, please see the CPU Unit Users Manual (COM Port Communication).**

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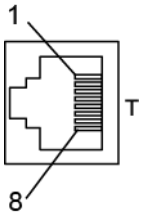
1.1.2 LAN Port Specifications

■ **100BASE-TX / 10BASE-T connector (RJ45)**

This connector connects the ET-LAN Unit and the Hub in Ethernet (100BASE-TX, 10BASE-T) and UTP Cable.



Pin no.	Signal name
1	TX+
2	TX-
3	RX+
4	Not used
5	Not used
6	RX-
7	Not used
8	Not used

■ **Functions of LED lamps**

(1) LINK

Turns on when connection is established between the FP7 CPU unit and a device on Ethernet.

(2) ACK

Flashes when some communication is in progress with a connected device (e.g. sending/receiving a command or response).

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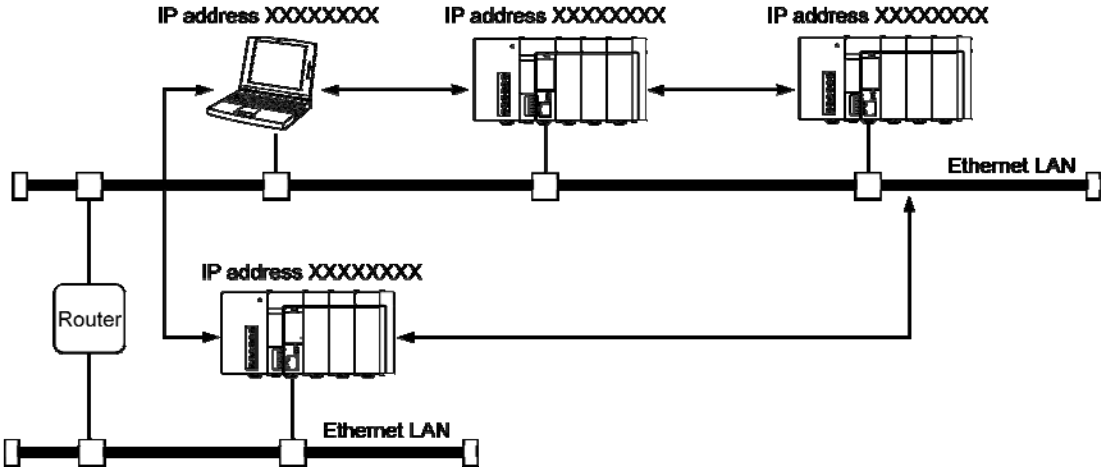
1.2 Functions of LAN Port

1.2.1 Communication Functions of FP7 CPU Unit

■ **Configuration chart**



■ **Communication functions of FP7 CPU Unit**

- The FP7 CPU Unit can open a virtual communication line with an Ethernet-supporting device connected to LAN, and send/receive data.
- IP address of the FP7 CPU unit, protocol (TCP/UDP), connection method with devices, port numbers, etc. should be specified in the configuration menu of the programming tool FPWIN GR7.
- In master communication commands SEND/RECV, messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done simply by specifying the station no. and memory address and executing commands.
- Communication functions can be selected depending on the partner device to be connected.

1.2.2 System Connection

■ **Functions of system connection**

- System connection is used when using a programming tool via LAN port.
- Four connections are available per CPU unit.

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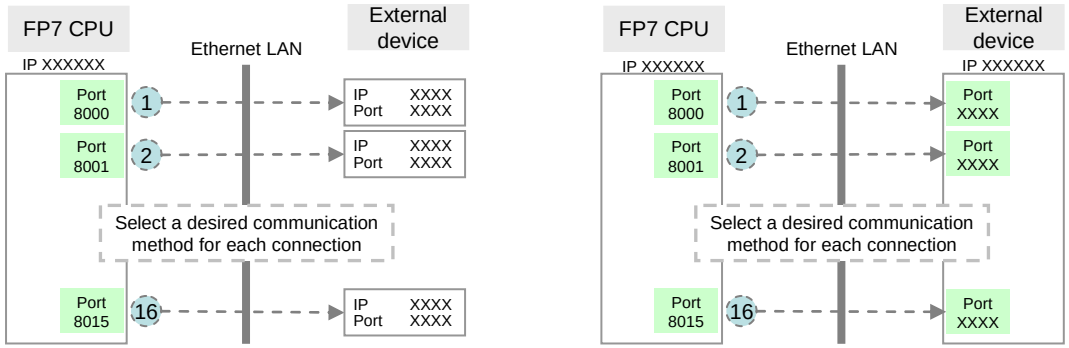
1.2.3 User Connection

■ Functions of user connection

- The FP7 CPU Unit can open virtual communication lines for up to 16 connections with Ethernet-supporting devices connected to LAN, and send/receive data.
- It can open multiple connections between the FP7 CPU unit and multiple nodes or a single node, and execute communication.
- Operation mode, open method, protocol, etc. can be selected for each connection.



Note) Circled numbers in the figure above indicate examples of allocation of connection numbers.

■ Connection operation

- Connection is opened from either the FP7 CPU unit side or the external device side.
- The open method should be selected from server connection (unspecified partner), server connection (specified partner), and client connection, in the configuration menu of FPWIN GR7.
- Once connection is established, communication by a user program becomes possible in accordance with the operation mode.

■ Supported operation mode

Communication port	MEWTOCOL-DAT		MEWTOCOL7-COM MEWTOCOL-COM		MODBUS-TCP		General-purpose communication
	Master	Slave	Master	Slave	Master	Slave	
LAN port	●	●	○ (Note)	●	●	●	●

(Note) MEWTOCOL7-COM does not support master functions.

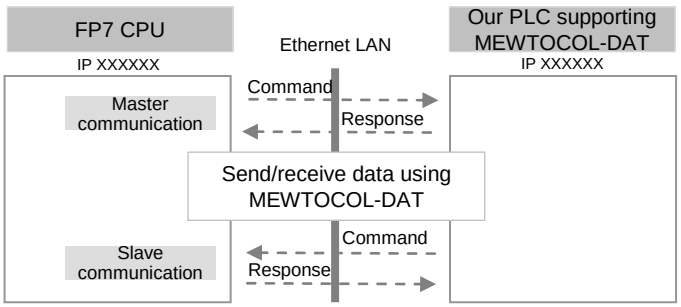
1.3 Overview of Communication Functions

1.3.1 MEWTOCOL-DAT Master/Slave Communication (Binary Communication)

■ Overview of function

- Execute communication using MEWTOCOL-DAT, a communication protocol usd by our PLC.
- One of the PLC has the sending right, and executes communication by sending commands to PLCs that support MEWTOCOL-DAT, and receiving responses.
- The slave-side PLC responds automatically, so no program concerning communication is necessary.
- Also on the master-side PLC, messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done between PLCs simply by specifying the station no. and memory address and executing SEND/RECV commands.
- This is suitable for sending/receiving data between PLCs, because the data size that can be transmitted in a single communication is larger, and the transmission format is simpler and shorter, than the MEWTOCOL-COM communication (ASCII communication).
- The data size that can be sent or received in a single communication is up to 2038 words for register transmission and 1 bit for bit transmission.

(Note) In the case of connection with our PLC FP2 ET-LAN unit, the maximum size is 1020 words.



■ Purpose of MEWTOCOL-DAT communication

This is used for sending data with our PLC that supports MEWTOCOL-DAT via Ethernet.

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◆ KEY POINTS

- **When MEWTOCOL-DAT master/slave communication is used, select "TCP/IP" for the communication protocol in order to guarantee the reliability of communication.**

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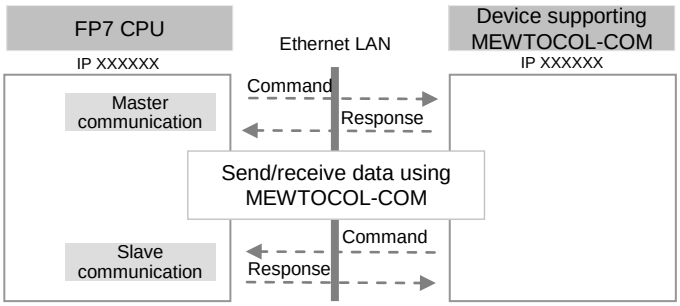
1.3.2 MEWTOCOL-COM Master/Slave Communication (ASCII Communication)

■ Overview of function

- Execute communication using MEWTOCOL-COM, a communication protocol used by our PLC.
- One of the device has the sending right, and executes communication by sending commands to devices that support MEWTOCOL-COM, and receiving responses.
- The slave-side PLC responds automatically, so no program concerning communication is necessary.
- Also on the master-side PLC, messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done simply by specifying the station no. and memory address and executing SEND/RECV commands.
- Because MEWTOCOL-COM communication is on an ASCII basis, it is suitable for sending/receiving text data.
- The data size that can be sent or received in a single communication is up to 507 words for register transmission and 1 bit for bit transmission.



■ Applications of MEWTOCOL-COM communication

This is used for sending text data between our devices that support MEWTOCOL-COM via Ethernet. This method can also be used for connecting a programming tool.

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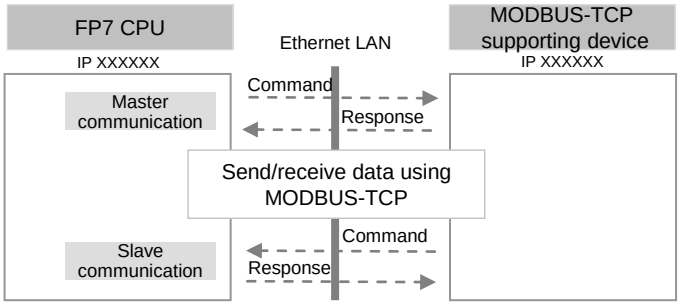
1.3.3 MODBUS TCP Master/Slave Communication

■ Overview of function

- This is used for communicating with other devices that support the MODBUS TCP protocol.
- In master communication, communication is performed when the master unit sends instructions (command messages) to slave units and the slave unit returns responses (response messages) according to the instructions. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done simply by specifying the station no. and memory address and executing SEND/RECV commands.
- Slave communication is performed when the higher device connected to PLC has the sending right, and sends commands, and PLC returns responses. In slave communication, PLC responds automatically, so no program concerning communication is necessary on the PLC side.
- The data size that can be sent or received in a single communication is up to 127 words for register transmission and 2040 bit for bit transmission.

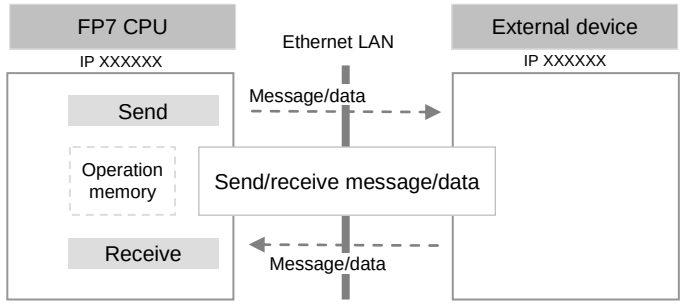


1.3.4 General-Purpose Communication

■ Overview of function

- General-purpose communication is used when PLC executes communication in accordance with the command specifications of the partner device.
- Formulation and sending of command messages to the partner device, and reception processing of responses from the partner device, are performed by the user program. Sending/receiving of data with an external device is executed via given operation memory (e.g. data register).
- Data are sent by setting message/data in a given data register in accordance with the partner device, and executing GPSEND command.
- Data received from the partner device are temporarily saved in the buffer. Based on the reception done flag, GPRECV command is executed and the received data are copied into a given operation memory. The received data can be converted into numerical data, etc. as necessary, by the user program.
- The data size that can be sent or received in a single communication is up to 16,372 bytes per connection.

(Note 1) When a dedicated header is not attached, the size is up to 16,384 bytes.
(Note 2) In the case of connection with our PLC FP2 ET-LAN unit, the maximum size is 8,192 bytes.



■ Applications of general-purpose communication

This is used for communication with devices made by differing manufacturers that have dedicated communication protocols.

1.4 Terms

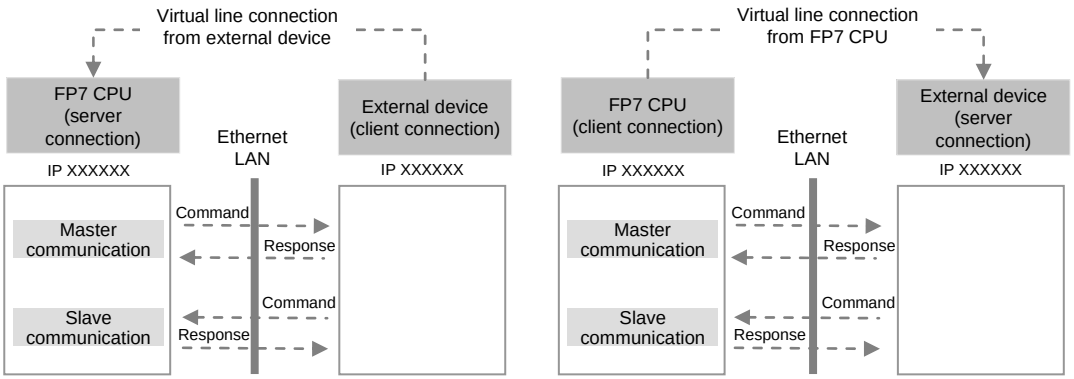
The following terms are used for settings on the software for connecting the FP7 CPU unit to Ethernet LAN, and in the Users Manuals.

■ Server connection and client connection

- These indicate methods for connecting a virtual communication line between FP7 and an external device.
- "Server connection" refers to a method to wait for connection from another client.
- "Client connection" refers to a method to connect a virtual communication line from the FP7 CPU unit to another external device port. Even if connection fails, repeated connection attempts are made at a specified interval.

■ Master communication and slave communication

- These indicate methods for actually sending/receiving messages and data between FP7 and an external device.
- In master communication, PLC sends commands and receives responses.
- In slave communication, commands are received from an external device, and responses are returned.
- In a system using FP7, whether server connection or client connection is selected, once connection is opened and a virtual communication line is connected, commands and responses can be sent and received from both sides.



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2

Installation and Wiring

2.1 Installation Environment and Wiring for LAN Ports

2.1.1 Before Installation and Wiring

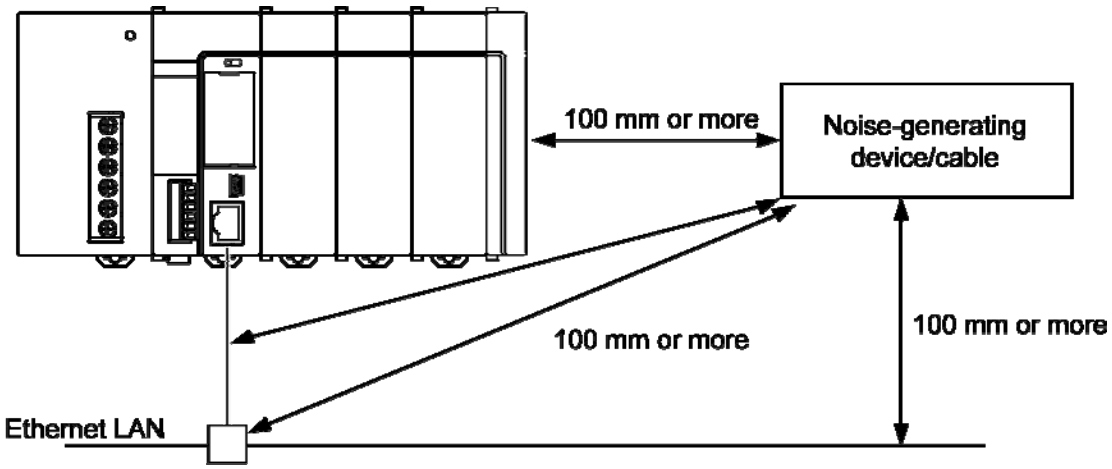
■ **Noise resistance of Ethernet**

The Ethernet is a network used in offices and buildings, where there is comparatively little noise. It does not have a higher resistance to noise than ordinary FA application networks. Caution is required when installing the hub, and when laying cables.

2.1.2 Installation Environment and Noise Control Measures

■ **Measures that can be taken in the installation environm ent**

- The CPU unit, transceiver, hub, and communication cables should be installed as far as possible from high-voltage wires, high-voltage equipment, power lines, power equipment, equipment that generates strong breaker surges, and the wiring for any of this equipment. At least 100 mm of clearance should be allowed when installing the equipment.



- When a device must be installed or a cable must be laid near a noise-generating device for special reasons, take measures such as:
  • install a programmable controller and a hub within a metal panel,
  • laying a communication cable inside a metal duct,
  • attaching a ferrite core near the CPU unit on the communication cable,
  etc.
- An alternative measure is to use an optical transceiver close to the noise-generating section of the equipment and install an optical fiber to keep the noise from affecting nearby equipment. (This is also effective as a lightning shield for outdoor wiring.)
- Metal panels and metal ducts should be grounded at a grounding resistance of 100 Ω or less. Also, metal panels and metal ducts should be insulated so that they do not come in contact with communication devices or cables.

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2.2 Wiring the LAN Port

■ **Selection of UTP cables**

- Use Category 5 UTP cable.
- It is recommended to use a UTP cable of 10 m or shorter, taking account of noise resistance.
- In an environment where noise may occur, attach a ferrite core near the CPU unit on the UTP cable. It is also recommended to use a shielded cable.

◆ **NOTE**

- **For installation of 100BASE-TX or 10BASE-T hub, laying of cables, etc., please consult a specialized construction company. If this construction work is done incorrectly, it can adversely affect the entire network, and can cause accidents.**

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2.3 Noise Control Measures

2.3.1 Guidelines to Noise Generation

- If any of the following are occurring, there is a danger that external noise is affecting the communication circuit. Appropriate measures should be taken.
- Check to see if a communication error is occurring, in synchronization with the operation of the device. If either of these is happening in synch with the operation of the device, take whatever measures are necessary to suppress the generation of noise from the device side.

2.3.2 Taking Corrective Measures through the Application

Communication errors occurring in the unit can be minimized by taking the steps outlined below. Corrective measures should also be taken on the computer side, such as increasing the number of times that data is sent.

■ Increasing the number of times data is sent

- In the tool software FPWIN GR7, select built-in ET-LAN, adjust the "TCP ULP timeout value" and "TCP re-transmission timer value" in "basic communication information" to increase the number of times data is sent.
- The number of times data is sent is given in the following formula. "TCP ULP timeout value" should be specified at an integral multiplication of "TCP re-transmission timer value". When an integral multiplication cannot be given, round up the given decimal number. The max. number of times data is sent is 12.

No. of times data is sent = "TCP ULP timeout value (packet existence duration)" / "TCP re-transmission timer value"

- The above setting is invalid when UDP/IP is used. Use the application to send the transmission again.

■ Increasing the timeout judgment time

When master communication commands (SEND/RECV) are executed, select "CPU configuration" in the tool software FPWIN GR7, and increase the set value for "time settings: timeout time for communication control commands" Default value is set at 10 seconds (set value: 100)

◆ REFERENCE

- **For configuration, please see 3.2.1 List of Setting Items.**

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3
Configuration

3.1 Procedure for Setting Communication Conditions

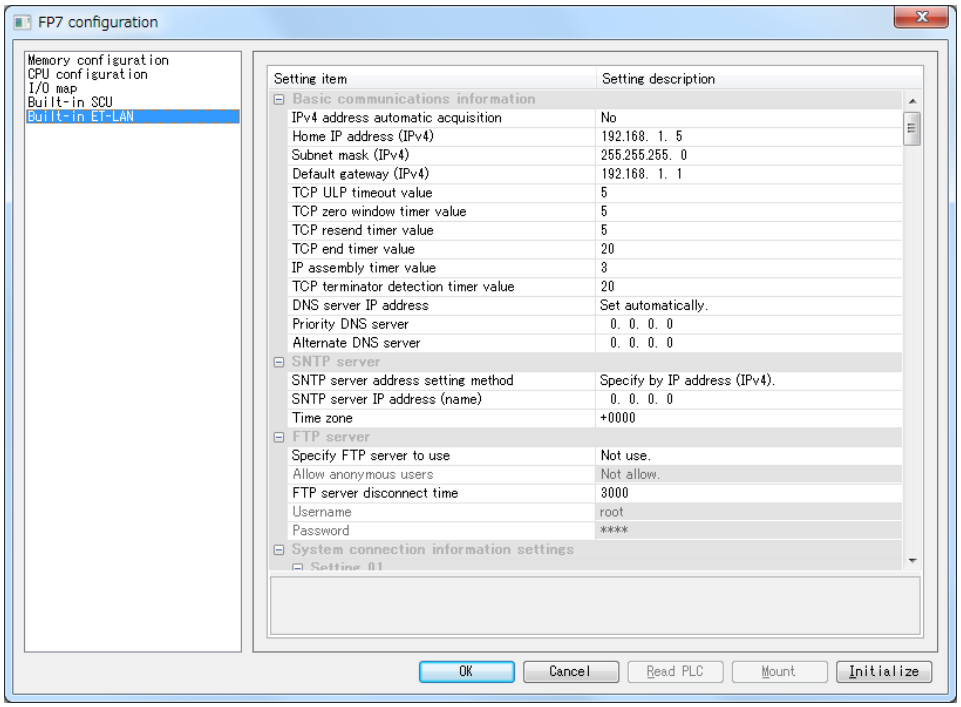
3.1.1 Setup Procedure

- To use communication functions based on the LAN port, communication conditions must be set.
- Settings should be performed by the programming tool FPWIN GR7.

◆ **PROCEDURE**

1. **From the menu bar, select "Option" > "FP7 Configuration".**
2. **From the left pane, select "Built-in ET-LAN".**

   Setting items appear.



3. **Specify conditions for each item under "Settings for Built-in ET-LAN", and press [OK] button.**

   The settings are registered in the project.

4. **Select [File] > [Save As] in the menu bar.**

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3.2 Setting Basic Communication Information

3.2.1 List of Setting Items

■ **List of setting items (basic communication information)**

Setting item	Default	Remark
Automatic getting of IPv4 address	No	
Own IP address (IPv4)	192.168.1.5	
Subnet mask (IPv4)	255.255.255.0	
Default gateway (IPv4)	192.168.1.1	This is valid as long as the network (subnetwork) mask field is anything other than 0. If the default router (gateway) IP address has been set, communication will be carried out through the default router (gateway) without an error occurring even f the class, network address, or subnetwork address of the partner node differ from those of the source node. The network (subnetwork) address for the default router (gateway) IP address must be identical to the network (subnetwork) address for the source node IP address. If they are different, an error will occur. ・0000 0000 H and FFFF FFFF H is regarded as an error.
TCP ULP time-out value	5	Setting range: 0001 - FFFF: (by 100 ms) With TCP, this specifies the time that a packet exists when data transmission, etc. is carried out. "TCP ULP" should be specified at an integral multiplication of "TCP re-transmission timer value". When an integral multiplication cannot be given, round up the given decimal number.
TCP zero-window timer value	5	Setting range: 0001 - FFFF: (by 100 ms) With TCP, this specifies the time until the receive window size check packet is re-sent when the receive window size of the other node becomes 0.
TCP re-transmission timer value	5	Setting range: 0001 - FFFF: (by 100 ms) With TCP, this specifies the time until data is re-sent if ACK is not sent by the other node, when data transmission, etc. is carried out.
TCP closed timer value	20	Setting range: 0001 - FFFF: (by 100 ms) This specifies the time waited until open processing is carried out when the same port is being re-opened, when TCP close processing is done by the source node.
IP assembling timer value	3	Setting range: 0001 - FFFF: (by 100 ms) This specifies the time waited for the next portion of data when data split by the IP is being received.
TCP terminal detection timer value	20	Setting range: 0001 - FFFF: (by 1 ms) When divided TCP segments are received, specify the time for monitoring the arrival of the following segment. TCP reception is regarded as completed if no data are received after the time as specified above has passed.
IP address of the DNS server	Set manually	
Prioritized DNS server	0.0.0.0	
Substitute DNS server	0.0.0.0	

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3.2.2 Setting Each Timer Value And Timeout Value

For setting each timer value and timeout value, please refer to the description below.

■ **Timer setting conditions in FPWIN GR7**

Timer setting conditions in FPWIN GR7 are as follows.

- TCP closed timer value ≥ TCP ULP timeout value ≥ TCP re-transmission timer value

AND

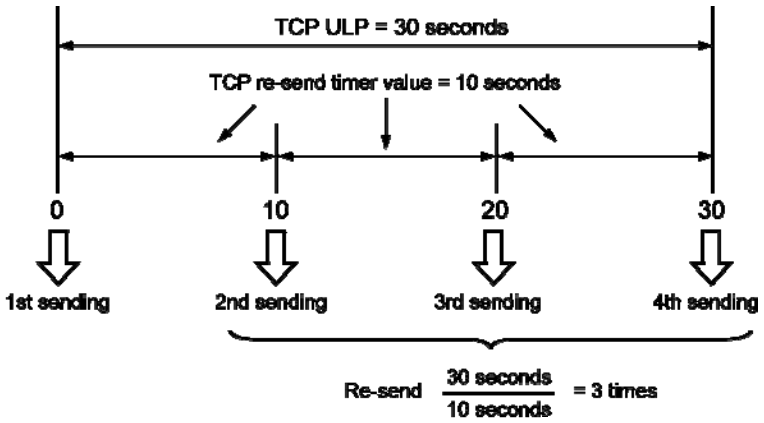
- TCP zero window timer value ≥ IP assembly timer value

■ **Setting the TCP ULP timeout value (packet existence duration) and the TCP re-transmission timer value**

When TCP/IP communication is being carried out, data is automatically re-sent the specified number of times, as shown in the illustration below.

$$\text{Number of re-sends} = \frac{\text{TCP ULP (packet existence duration)}}{\text{TCP re-transmission timer value}}$$

E.g. When TCP ULP: 30 seconds, TCP re-transmission timer value: 10 seconds



◆ **KEY POINTS**

- **Communication errors occurring in the unit can be minimized by increasing the number of re-transmission times. Corrective measures should also be taken on the computer side, such as increasing the number of times that data is sent.**
- **The max. number of times data is sent is 12.**
- **If UDP/IP is being used, re-sending is not carried out.**

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3.3 Settings for SNTP server

These settings are required when the time is synchronized by SNTP while the calendar timer function is being used.

■ **List of setting items (SNTP server)**

Setting item	Default	Setting method
SNTP server address - Setting method	Specification using IP address (IPv4)	Select the setting for SNTP server (specified by IP address (IPv4) / host name).
SNTP server IP address	0.0.0.0	Specify the setting for SNTP server (IP address / host name).
Time zone	+0000	Setting unit: ± HHMM (HH: hour, MM: minute) Setting range: +9999 to -9999 Specify a standard time zone in each region based on GMT.

3.4 Settings for FTP server

Select this to use the FTP server function.

■ **List of setting items (FTP server)**

Setting item	Default	Setting method
Specifying use of FTP server	No	Select whether you will use the FTP server function.
Permission of anonymous user	No	If authentication by user account and password is not required, select "Yes".
FTP server closing time	3000	Setting unit: 100 ms Setting range: 3,000 (0BB8H) to 429,496,729 (1999 9999 H) Input the no-communication monitoring time during FTP connection (unit: 100 ms). Connection is automatically cut off when FTP no-communication exceeds the specified time.
User name	root	
Password	root	

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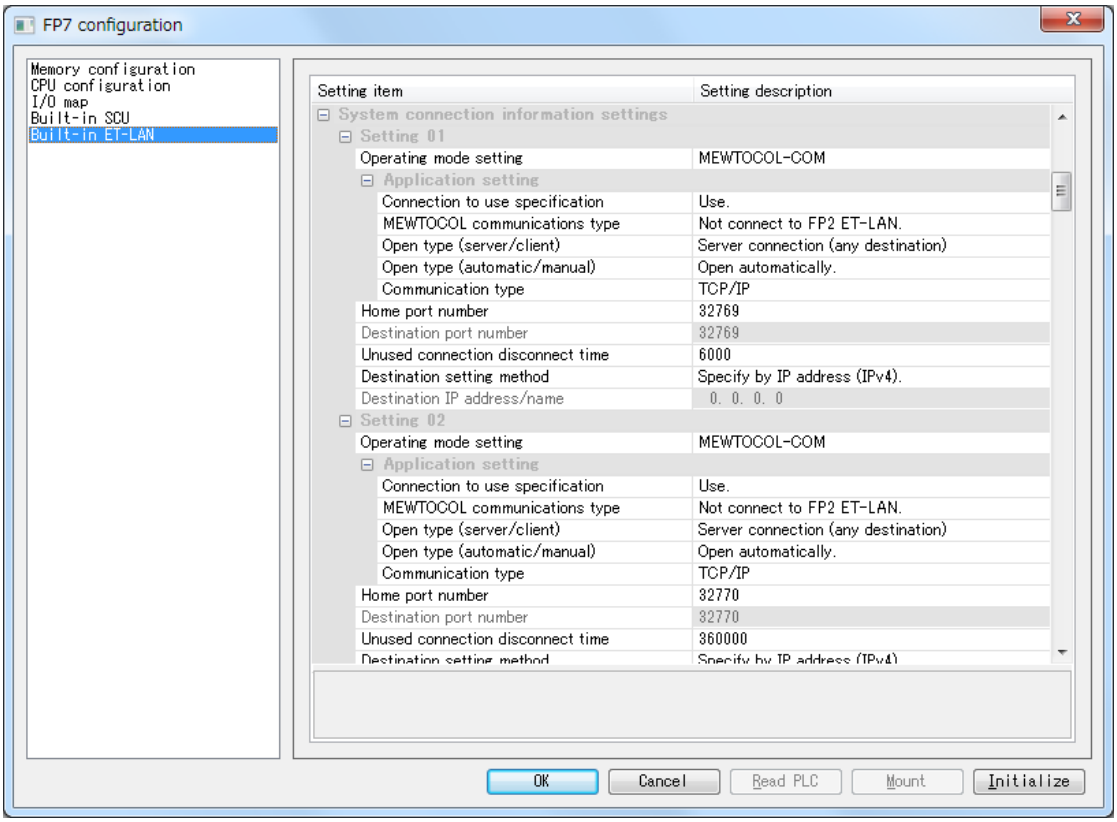
3.5 Setting of System Connection

3.5.1 List of Setting Items

System connection is used when using a programming tool via LAN port.

■ **List of setting items**

Setting item		Default	System Connection - Setting method
Operation Mode Setting		MEWTOCOL-COM	Select the operation mode MEWTOCOL-COM.
Setting of application use	Specifying use of connection	Yes	Specify whether system connection is to be used.
	MEWTOCOL communication type	Do not connect with FP2 ET-LAN	Select "Do not connect with FP2 ET-LAN".
	Open method (server/client)	Server connection (unspecified partner)	Select connection function settings (server connection (unspecified partner).
	Open method (auto/manual)	Auto OPEN	Select the connection open method (auto/manual). Select "Auto OPEN".
	Communication method	TCP / IP	Select the communication protocol (TCP/IP).
Source node port No.		Connection 01: 32769 Connection 02: 32770 Connection 03: 32771 Connection 04: 32772	Specify the source node (sender) port number.
Partner node port No.		Connection 01: 32769 Connection 02: 32770 Connection 03: 32771 Connection 04: 32772	Specify the partner node (receiver) port number. This needs not to be set if the partner node is not specified.
Connection closing time		Connection 01: 6000 Connection 02: 360000 Connection 03: 360000 Connection 04: 360000	Setting unit: Input the no-connection communication monitoring time. Connection is automatically cut off when no-connection communication exceeds the specified time.
Partner node - Setting method		Specification using IP address (IPv4)	Select the setting for partner node (IP address). This needs not to be set if the partner node is not specified.
Partner node IP address and name		0.0.0.0	Specify the setting for partner node (IP address / host name). This needs not to be set if the partner node is not specified.



Setting screen for system connection

◆ KEY POINTS

- **System connection is aimed at connecting a programming tool. Use this in default settings (MEWTOCOL-COM, server connection (unspecified partner), Auto OPEN, TCP/IP).**

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3.5.2 Setting on the Programming Tool Side

- Settings should be performed on the programming tool FPWIN GR7 side.

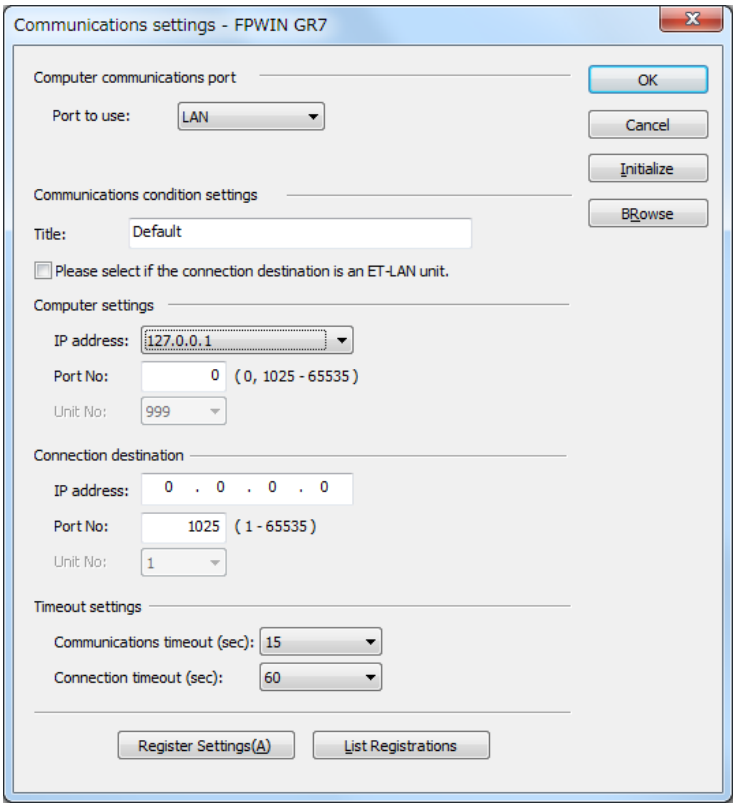
◆ PROCEDURE

1. From the menu bar, select "Online" > "Communication Settings".

The "Communication Settings" dialog box is displayed.

2. Switch the port to be used to "LAN".

Setting items for LAN connection are displayed.



3. In the "Connection destination" setting field, input the IP address and the port number.

4. Press [OK] button.

3.6 Setting of User Connection

3.6.1 List of Setting Items

■ **List of setting items**

Setting item			Default	Setting method
Operation Mode Setting			MEWTOCOL-COM	Select an operating mode (MEWTOCOL-COM / MEWTOCOL-COM7 / MODBUS-TCP / MEWTOCOL-DAT / general-purpose communication).
Setting of application use	Specifying use of connection		Not use	Specify whether each connection is to be used.
	MEWTOCOL communication type		Conditions to be selected vary by the selected operation mode.	
		MEWTOCOL-DAT MEWTOCOL-COM is selected	Not connect to FP2 ET-LAN	Not connect to FP2 ET-LAN / Connect to FP2 ET-LAN When communication is to be performed with the FP2 ET-LAN unit, select " Connect to FP2 ET-LAN".
		When selecting general-purpose communication	Attach a dedicated header	Attach / Do not attach a dedicated header When communication is to be performed with the FP2 ET-LAN unit, select "Do not attach a dedicated header".
	Open method (server/client)		Client connection	Select connection function settings (server connection (unspecified partner) / server connection (specified partner) / client connection).
	Open method (auto/manual)		Auto OPEN	Select the connection open method (auto/manual). Select "Auto OPEN".
	Communication method		TCP/IP	Select the communication protocol (TCP IP / UDP IP).
Source node port No.			0	Specify the source node (sender) port number.
Partner node port No.			0	Specify the partner node (receiver) port number.
Unused connection closing time			0	Input the no-connection communication monitoring time. Connection is automatically cut off when no-connection communication exceeds the specified time.
Partner node - Setting method			Specification using IP address (IPv4)	Select the setting for partner node (IP address / host name).
Partner node IP address and name			0.0.0.0	Specify the setting for partner node (IP address / host name).

◆ **KEY POINTS**

- **Select a desired operation mode.**
- **When client settings are used, select "Use in the connection settings" only for the connection to be used. When "Use in the connection settings" is selected, and if connection is failed, it is regarded as a communication error.**

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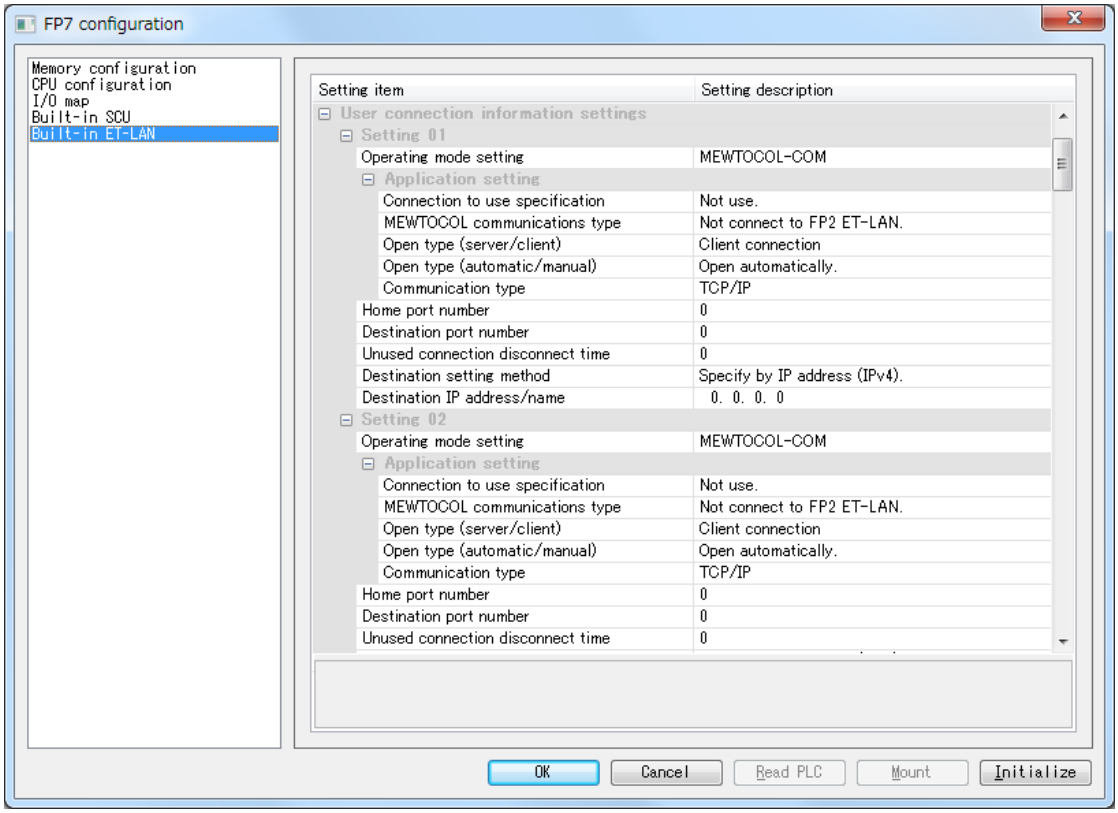
- **The MEWTOCOL communication type is a function to maintain compatibility with the existing models of FP2 ET-LAN unit. For connection between FP7 units, default values should be used.**
- **For the open method, select "Open automatically". For server connection / client connection, please see 4.1 Configuration Concerning Open Process.**

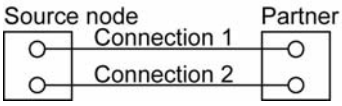
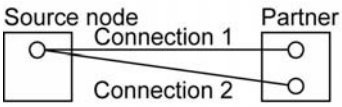
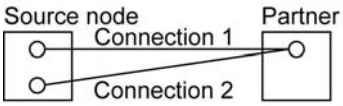
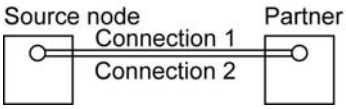
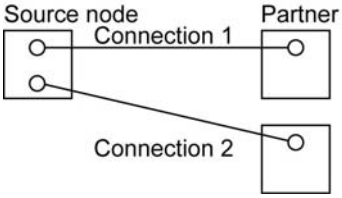
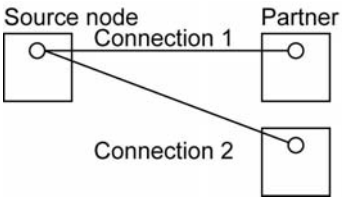


Setting screen for user connection

3.6.2 Specifying Port Number

■ Port number settings

- Port numbers are allocated in order for the various communication processes provided by the TCP/IP or UDP/IP to be differentiated by the programmable controller or the computer.
- The restrictions that apply to available port numbers are different for TCP/IP and UDP/IP, as indicated in the table below.

	Setting status of port no. in open processing		Applicable communication protocol	
			TCP/IP	UDP/IP
Multiple connections with a single partner node		Multiple settings for both source node port number and partner node port number	•	•
		Single setting for source node port number, multiple settings for partner node port number		
		Multiple settings for source node port number, single setting for partner node port number	•	
		Neither source node port number nor partner node port number can be set to single setting		
Connections with multiple nodes		Multiple settings for source node port number	•	•
		Single setting for source node port number		

◆ KEY POINTS

- **We recommend setting the port number to a value of 8000 (1F40) or higher.**
- **The same port number can be specified for the source node and the partner node.**
- **The same port number can be specified for TCP and UDP.**

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4

Setting and Operation of User Connection

4.1 Configuration Concerning Open Process

4.1.1 Connection of the FP7 CPU Unit

■ **Operation of the FP7 CPU unit**

- The FP7 CPU unit opens a virtual communication line with devices in accordance with user connection information (open method, communication method, port number, partner unit IP address) in the configuration menu.
- One FP7 CPU unit can open virtual communication lines for up to 16 connections.
- Lines for each connection can be used in different connection methods (TCP or UDP), and in different operation modes (MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP, general-purpose communication).
- Once a line is connected, PLC and devices can communicate in the specified operation mode. The connection status can be confirmed using the operation device (X80 - X9F).

4.1.2 Specifying Use of Connection

- Among the 16 connections, set the setting items for the user connection to be used to "Use these settings". By default, "Do not use these settings" is selected.
- In the case of client connection, when "Use these settings" is selected, and if connection is failed, it is regarded as a communication error.

4.1.3 Open Method (Server/Client)

Select the open method for establishing connection.

Setting item	Operation
Server connection (unspecified partner)	Wait for connection from an unspecified client.
Server connection (specified partner)	Wait for connection from a specified client.
Client connection	Connect to the partner port of server connection.

4.1.4 Open Method (Auto/Manual)

The operation varies according to settings. Select "Auto OPEN".

Settings	Operation
Auto OPEN	• When the power is turned ON, the FP7 CPU unit automatically opens a virtual communication line with devices in accordance with user connection information (open method, communication method, port number, partner unit IP address) in the configuration menu. • In the case of client connection, when connection cannot be established because the partner device is turned OFF or for other reasons, the unit makes repeated connection attempts at a specified interval. • In the case of server connection, the connection status is set to open, and the unit waits for connection from the client.
Do not auto OPEN	No process

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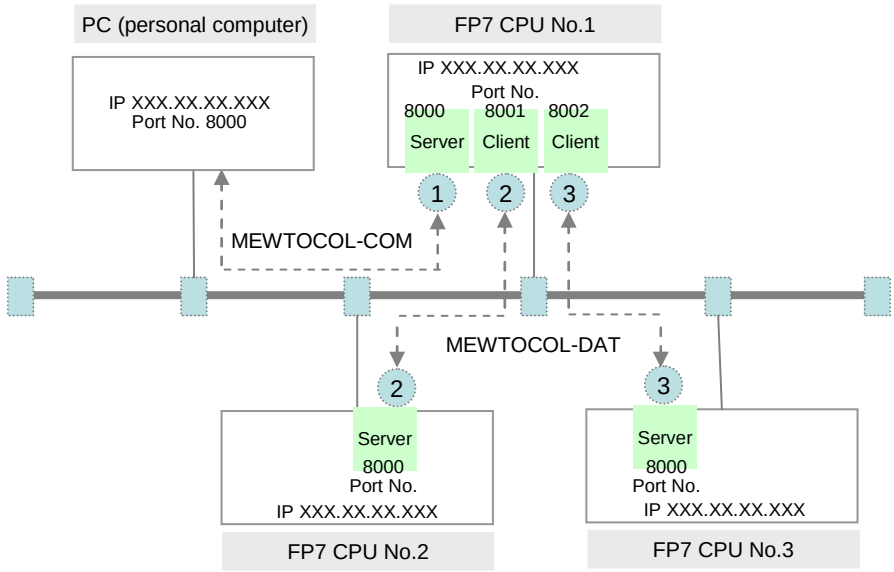
4.1.5 Instructions for Specifying Connection Conditions

- In Ethernet communication using the FP7 unit, different operation modes, open method, and communication methods can be specified for each connection.
- Specify the same conditions for operation mode (MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS-TCP, general-purpose communication) and communication methods (TCP/IP, UDP/IP) for devices to be connected in each connection. Also specify the IP address and port number of each device.



Note) Circled numbers in the figure above indicate examples of allocation of connection numbers.

■ **Setting example**

Node	Connection no.	Operation Mode Setting	Open method	Communication method	Remark
PC (personal computer)	-	MEWTOCOL-COM	Active Open	TCP / IP	Use applications that support MEWTOCOL-COM.
FP7 CPU No. 1	1	MEWTOCOL-COM	Server connection Auto Open	TCP / IP	
	2	MEWTOCOL-DAT	Client connection Auto Open	TCP / IP	
	3	MEWTOCOL-DAT	Client connection Auto Open	TCP / IP	
FP7 CPU No. 2	2	MEWTOCOL-DAT	Server connection Auto Open	TCP / IP	
FP7 CPU No. 3	3	MEWTOCOL-DAT	Server connection Auto Open	TCP / IP	

When the partner is FP2 ET-LAN unit, select "Connect FP2 ET-LAN" for the MEWTOCOL communication type.

4.2 Communication Processing

4.2.1 Communication Operation

■ Operation following connection

- Once connection is established, PLC and devices can communicate in the respectively specified operation mode.
- By default, the FP7 CPU unit is set to enable slave communication.
- When master communication is to be performed from the FP7 CPU unit to devices, use the dedicated commands SEND/RECV. When general-purpose communication is to be performed, use GPSEND/GPRECV commands.
- In the case of master communication commands (SEND/RECV), PLC automatically generates communication formats that support the protocol for each communication mode (MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP).
- When commands are sent from a higher device to the FP7 CPU unit, in communication formats that support the protocol for each communication mode (MEWTOCOL-DAT, MEWTOCOL-COM, MODBUS TCP), data are sent attached with the Ethernet header as necessary (to be selected by protocol or by partner). Here, the FP7 CPU unit responds automatically, so no program concerning communication is necessary on the PLC side.

■ Confirm sending/reception of each communication

- When communication is performed from the FP7 CPU unit and devices, the operation devices (X, Y) allocated to built-in ET-LAN are used for confirming reception, reading data, and/or confirming sending completion.
- Relevant flags are allocated to Device No. X70 - X9F and Y70 - Y9F.

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4.3 Input/Output Signals Used for Communication

4.3.1 I/O Allocation

■ **Input signal**

Input signal	Response connection	Name	Description	Effective Operation mode
X70	Connection 1	Reception general-purpose communication done flag	• When connection is ON in the general-purpose communication mode, the flag turns ON once data are received. • When general-purpose communication reception command (GPRECV) is executed, and receiving of data has been completed, the flag turns OFF. • When connection is in MEWTOCOL-DAT, MEWTOCOL-COM, or MODBUS TCP, the flag turns OFF.	General-purpose communication
X71	Connection 2			
---	---			
X79	Connection 10			
X7A	Connection 11			
X7B	Connection 12			
X7C	Connection 13			
X7D	Connection 14			
X7E	Connection 15			
X7F	Connection 16			
X80	Connection 1	Clear to send general-purpose communication flag	• When connection is ON in the general-purpose communication mode, the flag is ON. • When the connection is not ON, the flag is OFF. • When connection is in MEWTOCOL-DAT, MEWTOCOL-COM, or MODBUS TCP, the flag is OFF.	General-purpose communication
X81	Connection 2			
---	---			
X89	Connection 10			
X8A	Connection 11			
X8B	Connection 12			
X8C	Connection 13			
X8D	Connection 14			
X8E	Connection 15			
X8F	Connection 16			
X90	Connection 1	Clear to send master communication flag	• When connection is ON in the MEWTOCOL-DAT, MEWTOCOL-COM, or MODBUS TCP, the flag is ON. • When the connection is not ON, the flag is OFF. • When connection is in general-purpose communication, the flag is OFF.	MEWTOCOL-DAT MEWTOCOL-COM MODBUS TCP
X91	Connection 2			
---	---			
X99	Connection 10			
X9A	Connection 11			
X9B	Connection 12			
X9C	Connection 13			
X9D	Connection 14			
X9E	Connection 15			
X9F	Connection 16			

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■ **Output signal**

Output signal	Response connection	Name	Description	Effective Operation mode
Y70	Connection 1	Sending done result flag	• This reports the result when the execution of the general-purpose communication sending command (GPSEND), or the master communication commands (SEND/RECV), has been completed. • The flag turns OFF when transmission has been completed normally, and turns ON when transmission has been completed abnormally.	General-purpose communication MEWTOCOL-COM master MEWTOCOL-DAT master MODBUS TCP master
Y71	Connection 2			
---	---			
Y79	Connection 10			
Y7A	Connection 11			
Y7B	Connection 12			
Y7C	Connection 13			
Y7D	Connection 14			
Y7E	Connection 15			
Y7F	Connection 16			
Y80	Connection 1	Clear to send general-purpose communication flag	• The flag turns ON at the start of execution of the general-purpose communication sending command (GPSEND), and turns OFF when sending has been completed. • This flag turns ON at the start of execution of the sending command, and turns OFF when the command is executed following sending completion.	General-purpose communication
Y81	Connection 2			
---	---			
Y89	Connection 10			
Y8A	Connection 11			
Y8B	Connection 12			
Y8C	Connection 13			
Y8D	Connection 14			
Y8E	Connection 15			
Y8F	Connection 16			
Y90	Connection 1	Sending master communication flag	• The flag turns ON at the start of execution of the master communication sending command (SEND), and turns OFF when sending has been completed. • This flag turns ON at the start of execution of the sending command, and turns OFF when the ED command is executed following response reception completion.	MEWTOCOL-COM master MEWTOCOL-DAT master MODBUS TCP master
Y91	Connection 2			
---	---			
Y99	Connection 10			
Y9A	Connection 11			
Y9B	Connection 12			
Y9C	Connection 13			
Y9D	Connection 14			
Y9E	Connection 15			
Y9F	Connection 16			

◆ **NOTE**

- **Each contact in the table above is used for reading the operation status. Do not write over it with a user program.**

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5

MEWTOCOL Master/Slave Communication

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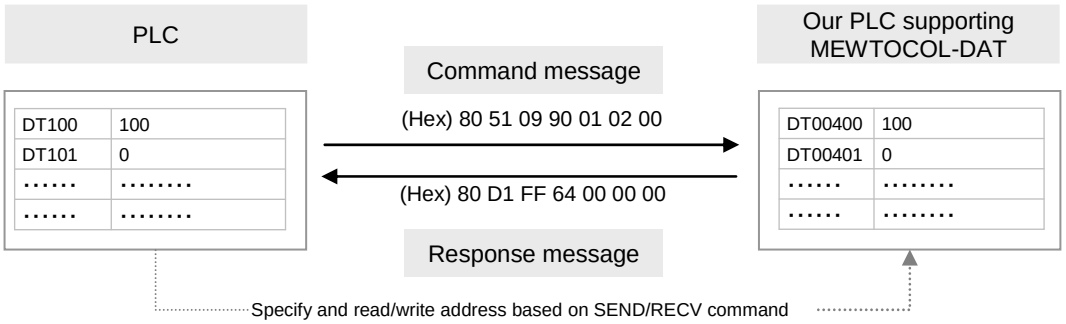
5.1 Types of MEWTOCOL Communication

5.1.1 MEWTOCOL-DAT (Binary Communication)

■ **Instructions**

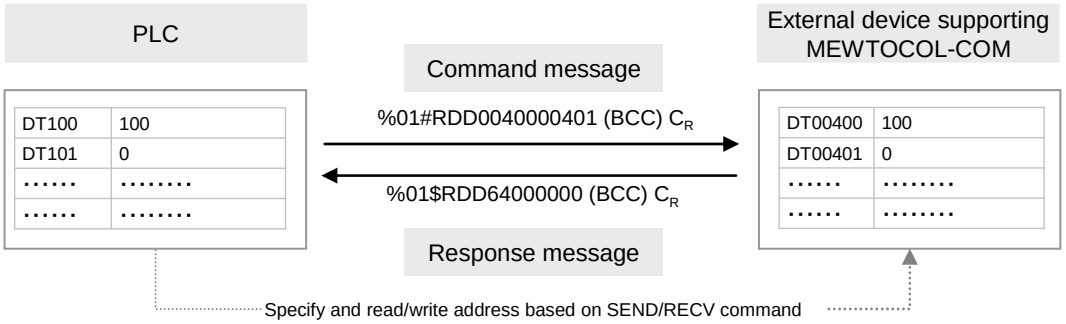
In master communication, PLC has the sending right, and executes communication by sending commands to devices that support MEWTOCOL-DAT, and receiving responses. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done simply by specifying the station no. and memory address and executing SEND/RECV commands.



Note: The above figure indicates the data part of MEWTOCOL-DAT. In communication via LAN, a header including size information of the sent data is added.

5.1.2 MEWTOCOL-COM (ASCII Communication)

In master communication, PLC has the sending right, and executes communication by sending commands to devices that support MEWTOCOL-COM, and receiving responses. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done simply by specifying the station no. and memory address and executing SEND/RECV commands.



Note: The above figure indicates the data part of MEWTOCOL-COM. In communication via LAN, a header including size information of the sent data is added.

Note) In MEWTOCOL-COM7, there is no master communication function.

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5.2 List of MEWTOCOL Supporting Commands

5.2.1 MEWTOCOL-DAT

Type of instruction	Code	Description
Write data area	50H	Writes data to a data area.
Read data area	51H	Reads the contents of a data area.
Write contact information	52H	Turn ON or OFF contact in the specified area.
Read contact information	53H	Read ON/OFF status of contact in the specified area.

5.2.2 MEWTOCOL-COM

Type of instruction	Code	Description
Read contact area	RC	Reads ON/OFF status of contact.
	(RCS)	- Specifies only a single contact.
	(RCP)	- Specifies multiple contacts.
	(RCC)	- Specifies a range in word units.
Write contact area	WC	Turns ON or OFF the contact.
	(WCS)	- Specifies only a single contact.
	(WCP)	- Specifies multiple contacts.
	(WCC)	- Specifies a range in word units.
Read data area	RD	Reads the contents of a data area.
Write data area	WD	Writes data to a data area.
Register or Reset contacts monitored	MC	Registers the contact to be monitored.
Register or Reset data monitored	MD	Registers the data to be monitored.
Monitoring start	MG	Monitors a registered contact or data using MC and MD.
Preset contact area (fill command)	SC	Embeds the area of a specified range in a 16-point on/off pattern.
Preset data area (fill command)	SD	Writes the same contents to the data area of a specified range.
Read the status of PLC	RT	Reads the specifications of the programmable controller and error codes if an error occurs.
Abort	AB	Aborts reception of multiple frame responses before completion.

(Note) Some devices are not accessible due to format restrictions of MEWTOCOL-COM communication commands.

5.2.3 MEWTOCOL7-COM

■ Commands to be used

Type of instruction	Code	Description
Read data area	MMRD	Reads the contents of a data area.
Write data area	MMWT	Writes data to a data area.

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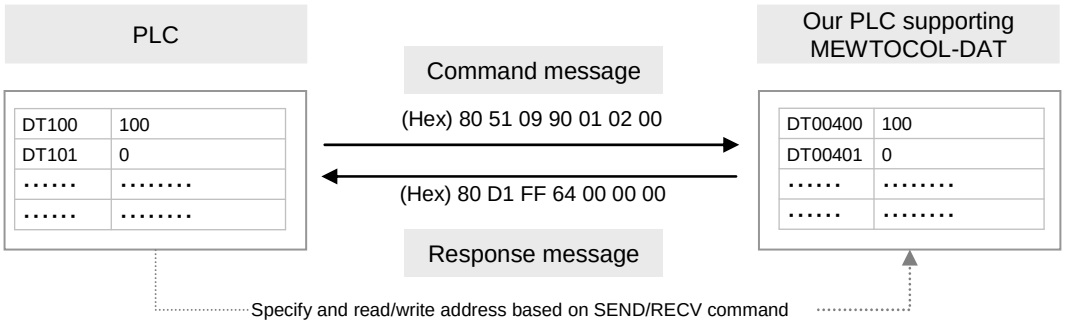
5.3 MEWTOCOL Master Communication (RECV)

5.3.1 Read Data From an External Device

■ Instructions

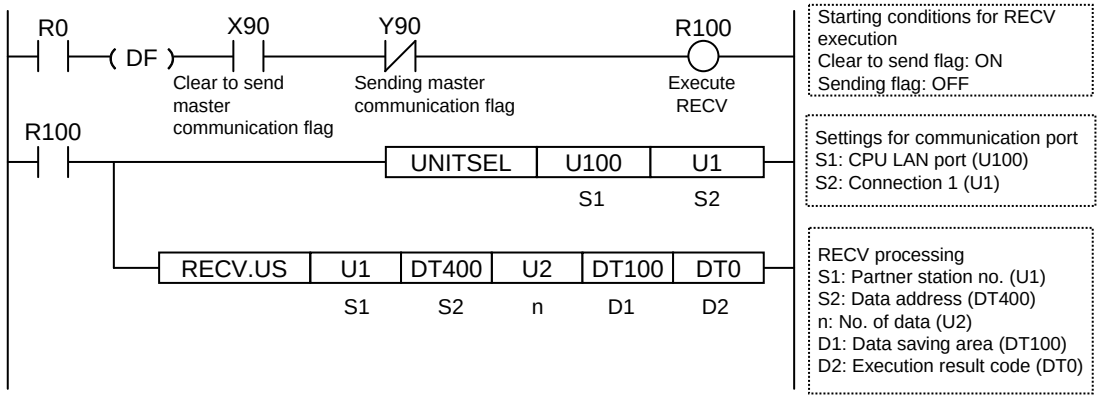
In master communication, PLC has the sending right, and executes communication by sending commands to devices that support MEWTOCOL, and receiving responses. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading can be done simply by specifying the station no. and memory address and executing RECV commands.



Note: The above figure indicates the data part of MEWTOCOL-DAT. In communication via LAN, a header including size information of the sent data is added.

■ Sample program

- Send commands from the LAN port of the CPU unit, read data from the data area of an external device DT400 - DT401, and write the content into PLC's data register DT100 - DT101.
- Confirm that Connection 1 is established in the master mode (X90), and that the sending process is not in progress for the same port (Y90), and start up the SEND command.
- In the UNITSEL command, specify the slot No. (LAN port: U100) and the connection No. (U1).
- In the RECV command, specify and execute the partner station no. (U1), initial address (DT400), No. of data (U2), and initial address on the PLC side to save data (DT100).



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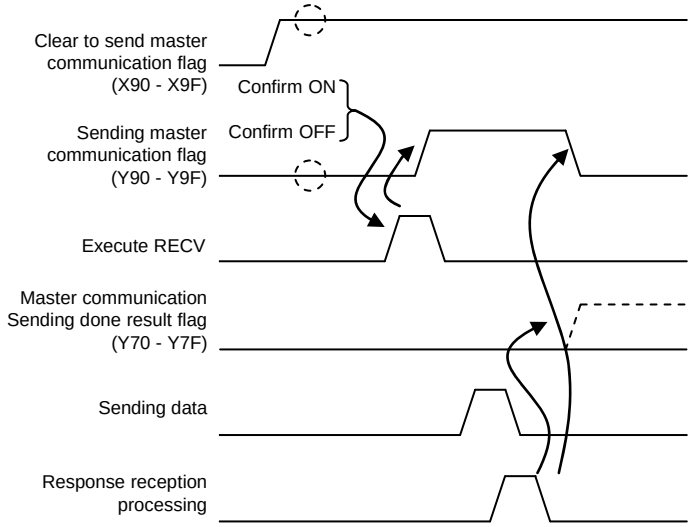
■ Timing chart


Clear to send master communication flag (X90 - X9F)
Confirm ON
Confirm OFF
Sending master communication flag (Y90 - Y9F)
Execute RECV
Master communication Sending done result flag (Y70 - Y7F)
Sending data
Response reception processing
Conditions to enable execution of RECV command
Clear to send flag (X90 - X9F): ON
Sending flag (Y90 - Y9F): OFF
Sending flag (Y90 - Y9F):
During the sending process: ON
During execution of ED command following response reception processing: OFF
Sending done result flag (Y70 - Y7F):
Normal completion: OFF
Abnormal completion: ON

■ I/O Allocation

I/O number	Name	Explanation
X90 - X9F	Clear to send master communication flag	When connection is ON in the master communication mode, the flag is ON.
Y90 - Y9F	Sending master communication flag	Turns ON during sending data based on SEND/RECV command. Turns OFF when ED command is executed following response reception processing.
Y70 - Y7F	Sending done result flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

(Note 1) Each contact is used for reading the operation status. Do not write over it with a user program.

◆ KEY POINTS

- **Specify the connection No. targeted for communication, using UNITSEL command immediately before SEND/RECV command.**
- **Master communication is only valid when MEWTOCOL or MODBUS is selected. Confirm that the "clear to send master communication flag" (X90 - X9F) for the targeted connection is ON,, and execute SEND/RECV command.**
- **You cannot execute other SEND/RECV command for connection in master communication. Confirm that the "sending master communication flag" (Y90 - Y9F) is OFF, and execute command.**
- **You cannot execute SEND/RECV command for connection in slave communication.**
- **Up to 16 SEND/RECV commands can be executed simultaneously for different connections.**
- **In the case of communication between FP7 LAN ports, specify "U1" for the partner station no. The receiver is specified by IP address.**

5.3.2 RECV Command (When MEWTOCOL is Used)

■ Command format

Items	Settings	Setting range	
		MEWTOCOL-DAT	MEWTOCOL-COM
i	Specify the operation unit.	US / SS	
S1	Specify the partner station no.	1 - 64 (Note 1)	
S2	Specify the device initial address of the source node data area in the partner node. (Note 2) (Note 3)	0 - 65535	0 - 99999
n	Specify the No. of sent data. (Note 4)	1 - 2038 words or 1 bit (Note 5)	1 - 507 words or 1 bit
D1	Specify the device initial address of the receiver node data area in the source node.	(Note 2)	
D2	Specify the device area in the source node to save the execution result code (one word).	(Note 6)	

(Note 1) Specify "1" for connection between FP7 units. The receiver is specified by IP address.

(Note 2) Transmission methods vary by the type of device to be specified for the operands [S2] and [D1].

Device to be specified for [S2] and [D1]	Transmission method
16 bit device: WX, WY, WR, WL, DT, LD	Register transmission
1 bit device: X, Y, R, L, DT,n, LD, n	Bit transmission

(Note 3) Bit device DT, n and LD, n cannot be specified for the header of the sender data in the partner node.

(Note 4) The No. of sent data is on a word basis for register transmission, and on a bit basis for bit transmission.

(Note 5) The maximum number of words vary by settings of the MEWTOCOL communication type for user connection.

Connection settings: Setting of the MEWTOCOL communication type	Maximum no. of words
Do not connect with FP2 ET-LAN	2038 words
Connect with FP2 ET-LAN	1020 words

(Note 6): Devices that can be specified for [D2] are: WX, WY, WR, WL, DT, LD. Saved as one word in the specified area.

0: Normal completion
1: Communication port is being used for master communication
2: Communication port is being used for slave communication
3: No. of master communication commands that can be used simultaneously has been exceeded
4: Sending timeout
5: Response reception timeout
6: Received data error

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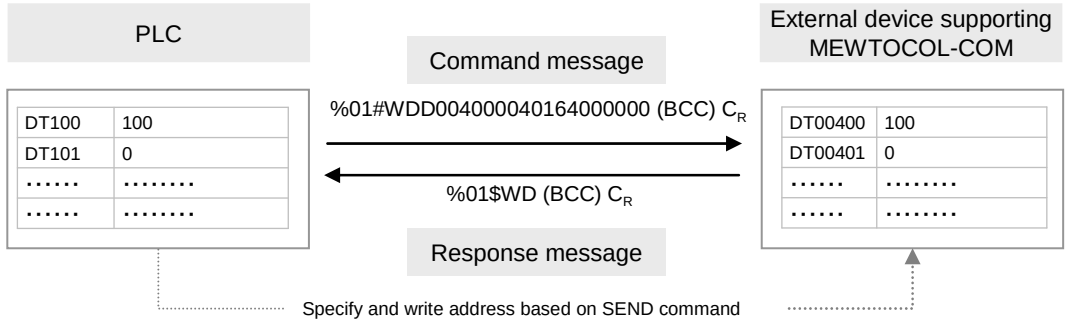
5.4 MEWTOCOL Master Communication (SEND)

5.4.1 Write Data into an External Device

■ Instructions

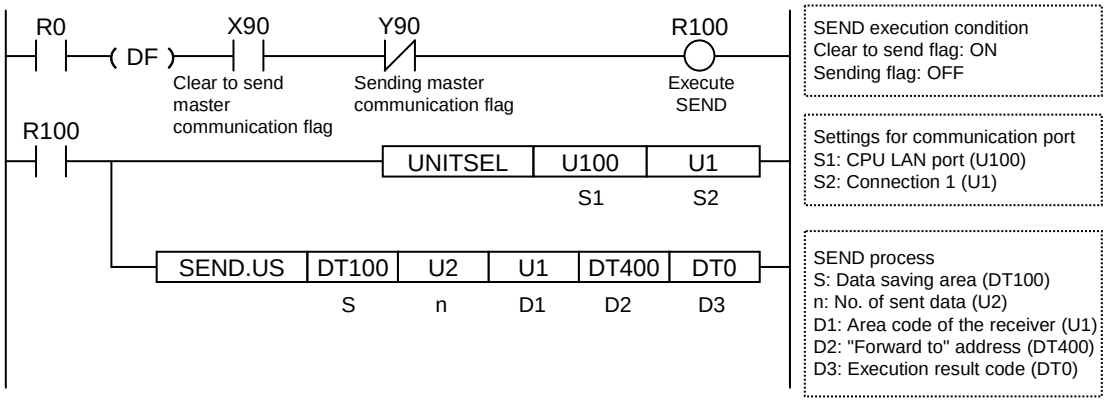
In master communication, PLC has the sending right, and executes communication by sending commands to devices that support MEWTOCOL, and receiving responses. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading can be done simply by specifying the station no. and memory address and executing SEND commands.



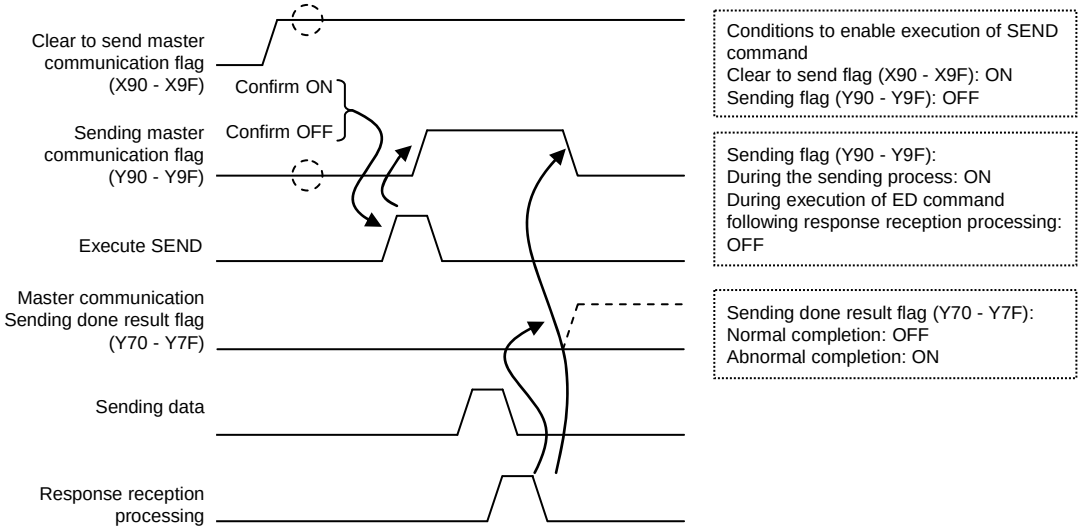
Note: The above figure indicates the data part of MEWTOCOL-COM. In communication via LAN, a header including size information of the sent data is added.

■ Sample program

- Send commands from the LAN port of the CPU unit, and write the content of PLC's data register DT100 - DT101 into the data area of an external device DT400 - DT401.
- Confirm that Connection 1 is established in the master mode (X90), and that the sending process is not in progress for the same port (Y90), and start up the SEND command.
- In the UNITSEL command, specify the slot No. (LAN port: U100) and the connection No. (U1).
- In the SEND command, specify and execute the sender initial address (DT100), No. of data (U2), "Transmit to" station no. (U1), and initial address (DT400).



■ Timing chart


Clear to send master communication flag (X90 - X9F)
Confirm ON
Confirm OFF
Sending master communication flag (Y90 - Y9F)
Execute SEND
Master communication Sending done result flag (Y70 - Y7F)
Sending data
Response reception processing
Conditions to enable execution of SEND command
Clear to send flag (X90 - X9F): ON
Sending flag (Y90 - Y9F): OFF
Sending flag (Y90 - Y9F):
During the sending process: ON
During execution of ED command following response reception processing: OFF
Sending done result flag (Y70 - Y7F):
Normal completion: OFF
Abnormal completion: ON

■ I/O Allocation

I/O number	Name	Explanation
X90 - X9F	Clear to send master communication flag	When connection is ON in the master communication mode, the flag is ON.
Y90 - Y9F	Sending master communication flag	Turns ON during sending data based on SEND/RECV command. Turns OFF when ED command is executed following response reception processing.
Y70 - Y7F	Sending done result flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

(Note 1) Each contact is used for reading the operation status. Do not write over it with a user program.

◆ KEY POINTS

- **Specify the connection No. targeted for communication, using UNITSEL command immediately before SEND/RECV command.**
- **Master communication is only valid when MEWTOCOL or MODBUS is selected. Confirm that the "clear to send master communication flag" (X90 - X9F) for the targeted connection is ON, and execute SEND/RECV command.**
- **You cannot execute other SEND/RECV command for connection in master communication. Confirm that the "sending master communication flag" (Y90 - Y9F) is OFF, and execute command.**
- **You cannot execute SEND/RECV command for connection in slave communication.**
- **Up to 16 SEND/RECV commands can be executed simultaneously for different connections.**
- **In the case of communication between FP7 LAN ports, specify "U1" for the partner station no. The receiver is specified by IP address.**

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5.4.2 SEND Command (When MEWTOCOL is Used)

■ Command format

Setting item	Settings	Setting range	
		MEWTOCOL-DAT	MEWTOCOL-COM
i	Specify the operation unit.	US / SS	
S	Specify the header of the source node data area.	(Note 1)	
n	Specify the No. of sent data. (Note 2)	1 - 2038 words or 1 bit (Note 3)	1 - 507 words or 1 bit
D1	Specify the partner station no.	1 - 64 (Note 4)	
D2	Specify the initial address of the receiver node data area in the partner node. (Note 1) (Note 5)	0 - 65535	0 - 99999
D3	Specify the device area in the source node to save the execution result code (one word).	(Note 6)	

(Note 1) Transmission methods vary by the type of device to be specified for the operands [S] and [D2].

Device to be specified for [S2] and [D1]	Transmission method
16 bit device: WX, WY, WR, WL, DT, LD	Register transmission
1 bit device: X, Y, R, L, DT, n, LD, n	Bit transmission

(Note 2) The No. of sent data is on a word basis for register transmission, and on a bit basis for bit transmission.

(Note 3) Configuration: The maximum number of words vary by settings of the MEWTOCOL communication type for user connection.

Connection settings: Setting of the MEWTOCOL communication type	Maximum no. of words
Do not connect with FP2 ET-LAN	2038 words
Connect with FP2 ET-LAN	1020 words

(Note 4) Specify "1" for connection between FP7 units. The receiver is specified by IP address.

(Note 5) Bit device DT, n and LD, n cannot be specified for the header of the receiver data in the partner node.

(Note 6): Devices that can be specified for [D3] are: WX, WY, WR, WL, DT, LD. Saved as one word in the specified area.

0: Normal completion
1: Communication port is being used for master communication
2: Communication port is being used for slave communication
3: No. of master communication commands that can be used simultaneously has been exceeded
4: Sending timeout
5: Response reception timeout
6: Received data error

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6

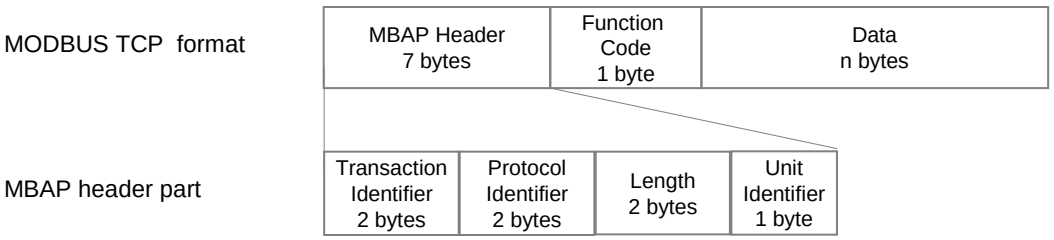
MODBUS TCP
Master/Slave Communication

6.1 MODBUS TCP Format

6.1.1 MODBUS TCP

■ Data structure for the MODBUS TCP format

- In MODBUS TCP, an MBAP header is attached to the function codes and data used in MODBUS-RTU.



■ Data contents

Fields		Field name	Description
MBAP Header	Transaction Identifier	Transaction identifier	"00H" is entered.
	Protocol Identifier	Protocol identifier	"00H" is entered.
	Length	Length	The length of the subsequent sending/receiving message is entered.
	Unit Identifier	Unit identifier	Station no. of the unit is entered. 0 - 247
Function code		Function code	The same function name as that of MODBUS-RTU is entered.
Data		Data	Data that correspond to the function code are entered.

◆ KEY POINTS

- **Function codes and data parts for MODBUS TCP are the same as those for MODBUS-RTU. Note that, however, CRC check codes contained in the MODBUS-RTU format are not included.**

◆ REFERENCE

For detailed specifications concerning MODBUS, please see the website.

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6.2 List of MODBUS TCP Supported Commands

6.2.1 List of MODBUS Function Codes

■ **Table of supported commands**

Code	Name (MODBUS)	Name	Remarks (Reference no.)	FP7 supported functions
01	Read Coil Status	Read Y and R Coils	0X	●
02	Read Input Status	Read X Input	1X	●
03	Read Holding Registers	Read DT	4X	●
04	Read Input Registers	Read WL and LD	3X	●
05	Force Single Coil	Write Single Y and R	0X	●
06	Preset Single Register	Write DT 1 Word	4X	●
08	Diagnostics	Loopback Test	-	-
15	Force Multiple Coils	Write Multiple Y's and R's	0X	●
16	Preset Multiple Registers	Write DT Multiple Words	4X	●
22	Mask Write 4X Register	Write DT Mask	4X	-
23	Read/Write 4X Registers	Read/Write DT	4X	-

(Note 1) Types of MODBUS function codes vary by commands to be used.

■ **Table for MODBUS reference No. and device No.**

MODBUS reference no.		Data on BUS (hexadecimal)	PLC device number
Coil	000001-002048	0000-07FF	Y0-Y127F
	002049-034816	0800-87FF	R0-R2047F
Input	100001-108192	0000-1FFF	X0-X511F
Holding register	400001-465536	0000-FFFF	DT0-DT65535
Input register	300001-301024	0000-03FF	WL0-WL1023
	302001-318384	07D0-47CF	LD0-LD16383

(Note 1) The table above indicates correspondence between the MODBUS reference numbers for accessing from a higher device to FP7 using the MODBUS protocol, and the operation device numbers of FP7.

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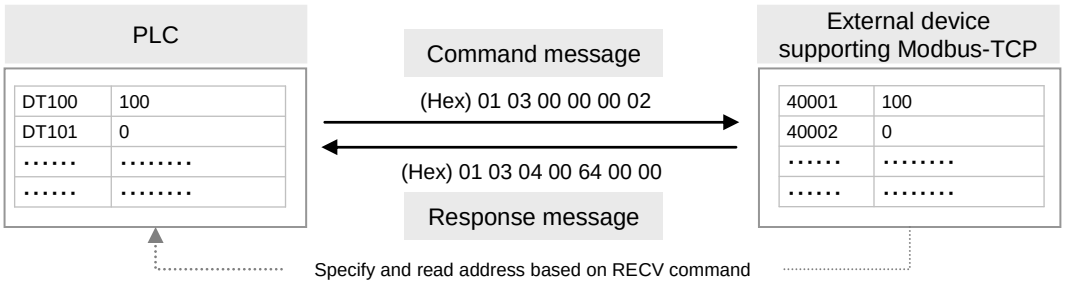
6.3 MODBUS TCP Master Communication (RECV)

6.3.1 Read Data from an External Device

■ Instructions

In master communication, PLC has the sending right, and executes communication by sending commands to devices that support MODBUS, and receiving responses. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading can be done simply by specifying the station no. and memory address and executing RECV commands.



Note: The above figure indicates the data part of Modbus function. In communication via LAN, a header including size information of the sent data is added.

■ Sample program

- Send MODBUS commands (03) from the LAN port of the CPU unit, read data from the data area of an external device 40001 - 40002 (MODBUS address 0000H - 0001H), and write the content into PLC's data register DT100 - DT101.
- Confirm that Connection 1 is established in the master mode (X90), and that the sending process is not in progress for the same port (Y90), and start up the SEND command.
- In the UNITSEL command, specify the slot No. (LAN port: U100) and the connection No. (U1).
- In the RECV command, specify and execute the types of MODBUS commands, as well as the partner station no. (H0301), initial address (H0), No. of data (U2), and initial address on the PLC side to save data (DT100). For the address of the partner device, please check operating instructions, etc. of the relevant device.

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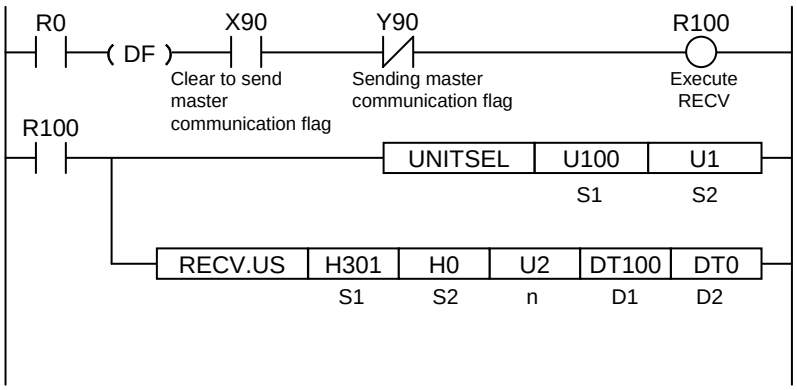
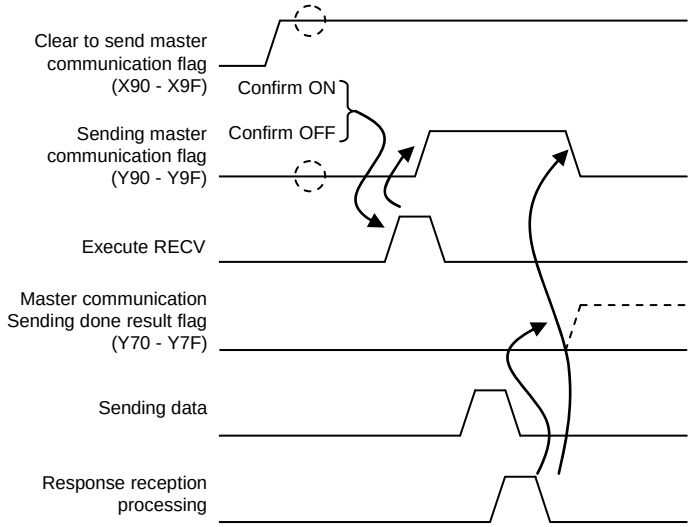


Starting conditions for RECV execution
Clear to send flag: ON
Sending flag: OFF

Settings for communication port
S1: CPU LAN port (U100)
S1: Connection 1 (U1)

Execute RECV command
S1: MODBUS command (H03)
Partner station no. (H01)
S2: Data address (H0)
n: No. of data (U2)
D1: Data saving area (DT100)
D2: Execution result code (DT0)

■ Timing chart


Clear to send master communication flag (X90 - X9F)
Confirm ON
Confirm OFF
Sending master communication flag (Y90 - Y9F)
Execute RECV
Master communication Sending done result flag (Y70 - Y7F)
Sending data
Response reception processing

Conditions to enable execution of RECV command
Clear to send flag (X90 - X9F): ON
Sending flag (Y90 - Y9F): OFF

Sending flag (Y90 - Y9F):
During the sending process: ON
During execution of ED command following response reception processing: OFF

Sending done result flag (Y70 - Y7F):
Normal completion: OFF
Abnormal completion: ON

■ I/O Allocation

I/O number	Name	Explanation
X90 - X9F	Clear to send master communication flag	When connection is ON in the master communication mode, the flag is ON.
Y90 - Y9F	Sending master communication flag	Turns ON during sending data based on SEND/RECV command. Turns OFF when ED command is executed following response reception processing.
Y70 - Y7F	Sending done result flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

(Note 1) Each contact is used for reading the operation status. Do not write over it with a user program.

◆ KEY POINTS

- **Specify the connection No. targeted for communication, using UNITSEL command immediately before SEND/RECV command.**
- **Master communication is only valid when MEWTOCOL or MODBUS is selected. Confirm that the "clear to send master communication flag" (X90 - X9F) for the targeted connection is ON, and execute SEND/RECV command.**
- **You cannot execute other SEND/RECV command for connection in master communication. Confirm that the "sending master communication flag" (Y90 - Y9F) is OFF, and execute command.**
- **You cannot execute SEND/RECV command for connection in slave communication.**
- **Up to 16 SEND/RECV commands can be executed simultaneously for different connections.**
- **In the MODBUS-TCP mode, specify the partner station no. for the operand of SEND/RECV command.**

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6.3.2 RECV Command (MODBUS Function Code Specified Type)

■ Command format

■ Operand

Items	Settings			Setting range
i	Specify the operation unit.			US / SS
S1	Specify the MODBUS function codes and partner station no. to be used. (Note 1) (Note 2)			
		Higher byte	Two hexadecimal digits that indicate the MODBUS function code	H1 - H4 (1 - 4)
		Lower byte	Two hexadecimal digits that indicate the station no.	H1 - HF7 (1 - 247)
S2	Specify the source MODBUS address in the partner node.			H0~HFFFF (0 - 65535)
n	Specify the No. of sent data. (Note 3)			1 - 127 words 1 - 2040 bits
D1	Specify the device initial address of the receiver node data area in the source node. (Note 2)			-
D2	Specify the device area in the source node to save the execution result code (one word).			(Note 3)

(Note 1) Operand [S1] is specified by combining two hexadecimal digits of MODBUS function code with two hexadecimal digits of partner station no.
E.g. Specify "H030F" when MODBUS function code is 03 (Read Holding Registers) and station no. is 15.

(Note 2) Based on the types of device specified in operand [D1], the transmission methods and MODBUS function codes that can be used vary.

Device to be specified for [D1]	Transmission method	Values that can be specified in higher bytes of [S1]
16 bit device WX, WY, WR, WL, DT, LD	Register transmission	H1: Read Coil Status (01) H2: Read Input Status (02) H3: Read Holding Registers (03) H4: Read Input Registers (04)
1 bit device X, Y, R, L, DT, n, LD, n	Bit transmission	H1: Read Coil Status (01) H2: Read Input Status (02)

(Note 3) The No. of sent data is on a word basis for register transmission, and on a bit basis for bit transmission.

(Note 4): Devices that can be specified for [D2] are: WX, WY, WR, WL, DT, LD. Saved as one word in the specified area.
0: Normal completion
1: Communication port is being used for master communication
2: Communication port is being used for slave communication
3: No. of master communication commands that can be used simultaneously has been exceeded
4: Sending timeout
5: Response reception timeout
6: Received data error

6.3.3 RECV Command (MODBUS Function Code Unspecified Type)

■ Command format

■ Operand

Items	Settings	Setting range
i	Specify the operation unit.	US / SS
S1	Specify the partner station no.	H1 - HF7 (1 - 247)
S2	Specify the device initial address of the source node data area in the partner node. (Note 1) (Note 2)	H0 - HFFFF (0 - 65535)
n	Specify the No. of sent data. (Note 3)	1 - 127 words 1 - 2040 bits
D1	Specify the device initial address of the receiver node data area in the source node. (Note 1)	(Note 4)
D2	Specify the device area in the source node to save the execution result code (one word).	(Note 5)

(Note 1) Types of devices and transmission methods to be specified for operands [S2] and [D1], and MODBUS function codes to be used for command execution vary.

Device to be specified for [S2] and [D1]	Transmission method	MODBUS function codes to be used for command execution
16 bit device WX, WY, WR, WL, DT, LD	Register transmission	Read Coil Status (01) Read Input Status (02) Read Holding Registers (03) Read Input Registers (04)
1 bit device X, Y, R, L, DT, n, LD, n	Bit transmission	Read Coil Status (01) Read Input Status (02)

(Note 2) Bit device L; DT, n; and LD, n cannot be specified for the header of the sender data in the partner node.

(Note 3) The No. of sent data is on a word basis for register transmission, and on a bit basis for bit transmission.

(Note 4): Devices that can be specified for D1 are: WX, WY, WR, WL, DT, LD.

(Note 5): Devices that can be specified for D2 are: WX, WY, WR, WL, DT, LD. Saved as one word in the specified area.

0: Normal completion
1: Communication port is being used for master communication
2: Communication port is being used for slave communication
3: No. of master communication commands that can be used simultaneously has been exceeded
4: Sending timeout
5: Response reception timeout
6: Received data error

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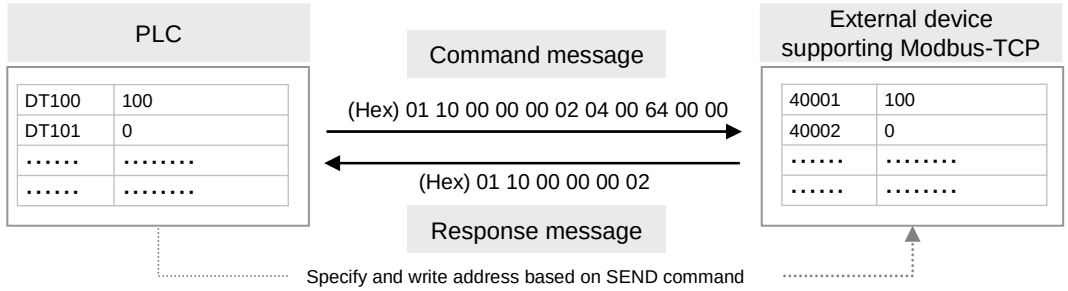
6.4 MODBUS TCP Master Communication (SEND)

6.4.1 Write Data into an External Device

■ Instructions

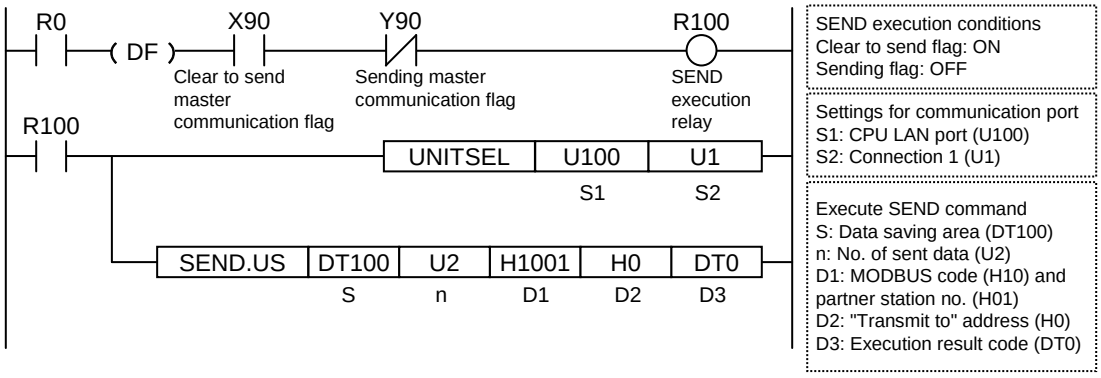
In master communication, PLC has the sending right, and executes communication by sending commands to devices that support MEWTOCOL, and receiving responses. Messages in accordance with the protocol are automatically generated by PLC. In the user program, reading and writing can be done simply by specifying the station no. and memory address and executing SEND/RECV commands.


PLC
DT100 100
DT101 0
Command message
(Hex) 01 10 00 00 00 02 04 00 64 00 00
(Hex) 01 10 00 00 00 02
Response message
External device supporting Modbus-TCP
40001 100
40002 0
Specify and write address based on SEND command

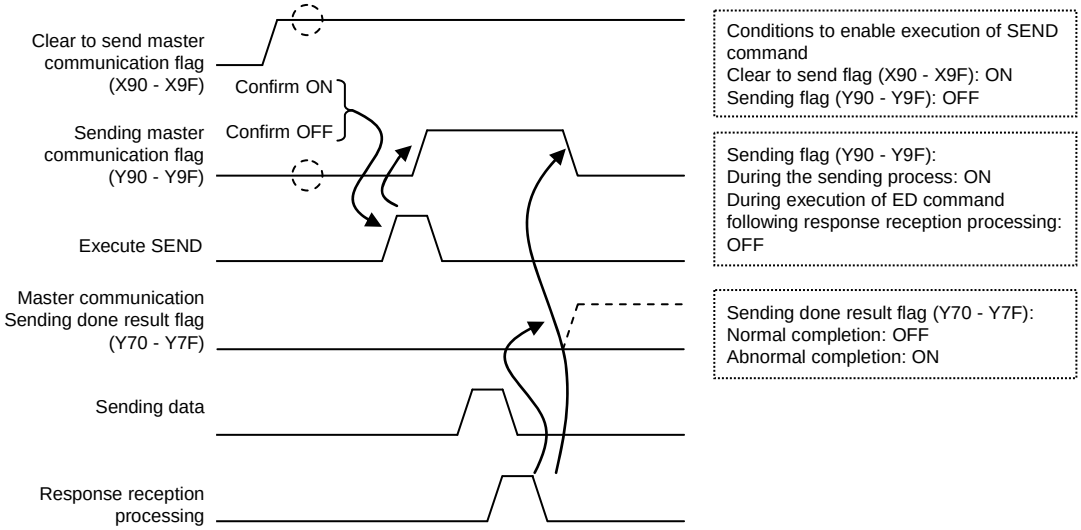
Note: The above figure indicates the data part of Modbus function. In communication via LAN, a header including size information of the sent data is added.

■ Sample program

- Send a MODBUS command (16) from the LAN port of the CPU unit, and write the content of PLC's data register DT100 - DT101 into the data area of an external device 40001 - 40002 (MODBUS address 0000H - 0001H).
- Confirm that Connection 1 is established in the master mode (X90), and that the sending process is not in progress for the same port (Y90), and start up the SEND command.
- In the UNITSEL command, specify the slot No. (LAN port: U100) and the connection No. (U1).
- In the SEND command, specify and execute the PLC initial address (DT100), No. of data (U2), MODBUS command (16 = H10), partner device station no. (H01), and initial address (H0). For the address of the partner device, please check operating instructions, etc. of the relevant device.



■ Timing chart


Clear to send master communication flag (X90 - X9F)
Confirm ON
Confirm OFF
Sending master communication flag (Y90 - Y9F)
Execute SEND
Master communication Sending done result flag (Y70 - Y7F)
Sending data
Response reception processing
Conditions to enable execution of SEND command
Clear to send flag (X90 - X9F): ON
Sending flag (Y90 - Y9F): OFF
Sending flag (Y90 - Y9F):
During the sending process: ON
During execution of ED command following response reception processing: OFF
Sending done result flag (Y70 - Y7F):
Normal completion: OFF
Abnormal completion: ON

■ I/O Allocation

I/O number	Name	Explanation
X90 - X9F	Clear to send master communication flag	When connection is ON in the master communication mode, the flag is ON.
Y90 - Y9F	Sending master communication flag	Turns ON during sending data based on SEND/RECV command. Turns OFF when ED command is executed following response reception processing.
Y70 - Y7F	Sending done result flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

(Note 1) Each contact is used for reading the operation status. Do not write over it with a user program.

◆ KEY POINTS

- **Specify the connection No. targeted for communication, using UNITSEL command immediately before SEND/RECV command.**
- **Master communication is only valid when MEWTOCOL or MODBUS is selected. Confirm that the "clear to send master communication flag" (X90 - X9F) for the targeted connection is ON, and execute SEND/RECV command.**
- **You cannot execute other SEND/RECV command for connection in master communication. Confirm that the "sending master communication flag" (Y90 - Y9F) is OFF, and execute command.**
- **You cannot execute SEND/RECV command for connection in slave communication.**
- **Up to 16 SEND/RECV commands can be executed simultaneously for different connections.**
- **In the MODBUS-TCP mode, specify the partner station no. for the operand of SEND/RECV command.**

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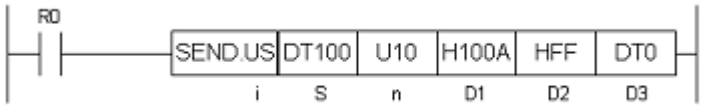
6.4.2 SEND Command (MODBUS Function Code Specified Type)

■ Command format



■ Operand

Items	Settings			Setting range
i	Specify the operation unit.			US / SS
S	Specify the header of the source node data area. (Note 1)			-
n	Specify the No. of sent data. (Note 1) (Note 2)			1 - 127 words 1 - 2040 bits
D1	Specify the MODBUS command and partner station no. to be used. (Note 3)			
		Higher byte	Two hexadecimal digits that indicate the MODBUS function code	H5, H6, HF, H10
		Lower byte	Two hexadecimal digits that indicate the station no.	H1 - HF7 (1 - 247)
D2	Specify the header of the MODBUS address in the receiver data area in the partner node.			H0 - HFFFF (0 - 65535)
D3	Specify the device area in the source node to save the execution result code (one word).			(Note 4)

(Note 1) Based on the types of device specified in operand [S] and the No. of sent data specified in [n], the transmission methods and MODBUS function codes that can be used vary.

Types of device to be specified in [S]	Transmission method	No. of sent data [n]	Values that can be specified in higher bytes of [D1]
16 bit device WX, WY, WR, WL, DT, LD	Register transmission	1	H6: Preset Single Register (06) HF: Force Multiple Coils (15) H10: Preset Multiple Registers (16)
		2 - 127	HF: Force Multiple Coils (15) H10: Preset Multiple Registers (16)
1 bit device X, Y, R, L, DT, n, LD, n	Bit transmission	1	H5: Force Single Coil (05) HF: Force Multiple Coils (15)
		2 - 2040	HF: Force Multiple Coils (15)

(Note 2) The No. of sent data [n] is on a word basis for register transmission, and on a bit basis for bit transmission.

(Note 3) Operand [D1] is specified by combining two hexadecimal digits of MODBUS function code with two hexadecimal digits of partner station no.
E.g. Specify "H0F0A" when MODBUS function code is 10 (Preset Multiple Registers) and station no. is 10.

(Note 4): Devices that can be specified for [D3] are: WX, WY, WR, WL, DT, LD. Saved as one word in the specified area.
0: Normal completion
1: Communication port is being used for master communication
2: Communication port is being used for slave communication
3: No. of master communication commands that can be used simultaneously has been exceeded
4: Sending timeout
5: Response reception timeout
6: Received data error

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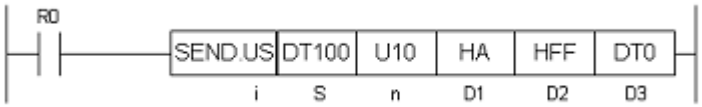
6.4.3 SEND Command (MODBUS Function Code Unspecified Type)

■ Command format



■ Operand

Items	Settings	Setting range
i	Specify the operation unit.	US / SS
S	Specify the header of the source node data area. (Note 1)	
n	Specify the No. of sent data. (Note 2)	1 - 127 words 1 - 2040 bits
D1	Specify the partner station no.	H1 - HF7 (1 - 247)
D2	Specify the initial address of the receiver node data area in the partner node. (Note 1) (Note 3)	H0 - HFFFF (0 - 65535)
D3	Specify the device area in the source node to save the execution result code (one word).	(Note 4)

(Note 1) Types of devices and transmission methods to be specified for operands [S] and [D2], and MODBUS function codes to be used for command execution vary.

Types of device to be specified in [S]	Transmission method	MODBUS function codes to be used for command execution
16 bit device WX, WY, WR, WL, DT, LD	Register transmission	Force Multiple Coils (15) Preset Multiple Registers (16)
1 bit device X, Y, R, L, DT, n, LD, n	Bit transmission	Force Multiple Coils (15)

(Note 2) The No. of sent data [n] is on a word basis for register transmission, and on a bit basis for bit transmission.

(Note 3) 16 bit device WX and WL; and 1 bit device X; L; DT, n; and LD, n cannot be specified for the header of the receiver data in the partner node.

(Note 4): Devices that can be specified for D3 are: WX, WY, WR, WL, DT, LD. Saved as one word in the specified area.
0: Normal completion
1: Communication port is being used for master communication
2: Communication port is being used for slave communication
3: No. of master communication commands that can be used simultaneously has been exceeded
4: Sending timeout
5: Response reception timeout
6: Received data error

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7

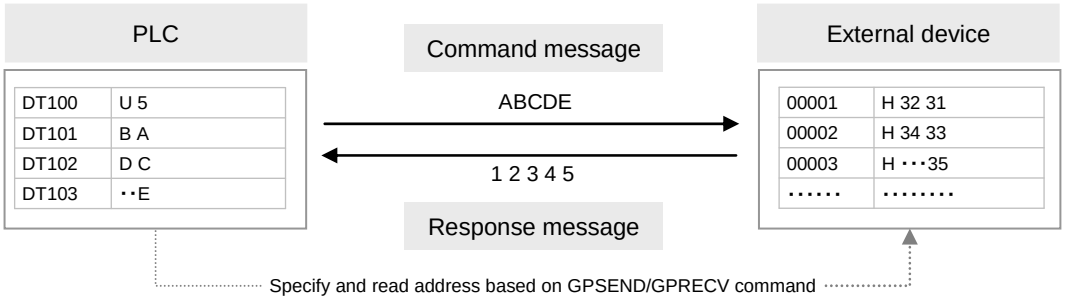
General-Purpose Communication

7.1 Operation of General-Purpose Communication

7.1.1 Read Data from an External Device

■ **Read data from a partner device**

In general-purpose communication, communication is executed by sending commands that suit the partner device, and receiving responses. Command messages are sent by formulating a data table for message in accordance with the protocol, on the given data register, and subsequently executing GPSEND command.

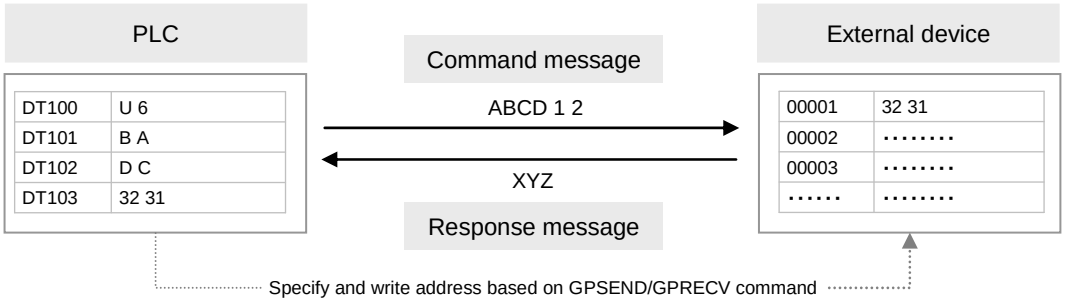


Note: The above figure indicates the data part. In communication via LAN, a header including size information of the sent data is added.

7.1.2 Write Data into an External Device

■ **Write data into a partner device**

In general-purpose communication, communication is executed by sending commands that suit the partner device, and receiving responses. Command messages are sent by formulating a data table for message in accordance with the protocol, on the given data register, and subsequently executing GPSEND command.



Note: The above figure indicates the data part. In communication via LAN, a header including size information of the sent data is added.

◆ **KEY POINTS**

- **There is no relevance between the operation of transmission by GPSEND command and the operation of reception by GPRECV command.**

7.1.3 Sending Format in General-Purpose Communication

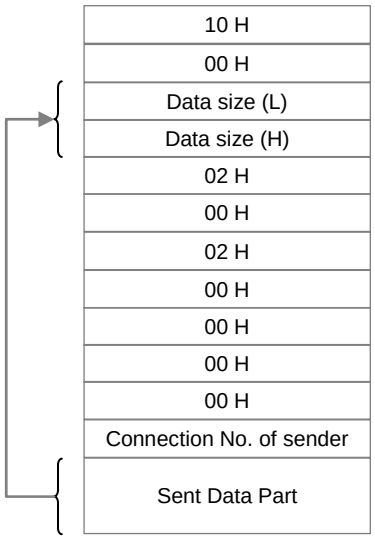
■ Difference in operation based on selection of communication types

- Data to be sent/received in LAN communication vary based on settings for user connection information: communication type.

Communication type Setting	Message type	Maximum no. of bytes for sent data	Receiving operation	Setting method
Attach a dedicated header	A header is attached to the message before sending.	Within 16,384 bytes	The receiving process is completed when data that correspond to the No. of sent bytes as indicated in the header have been received.	Select this when general-purpose communication is not executed with the FP2 ET-LAN unit.
Do not attach a dedicated header	A header is not attached to the message.	Within 8,192 bytes	The receiving process is completed when there is no more received data exceeding the TCP terminal detection timer value (default: 20 ms).	Select this when general-purpose communication is executed with the FP2 ET-LAN unit, or communication without a dedicated header is desired.

■ Sent message format for general-purpose communication

When "Attach a dedicated header" is selected for communication type, a header as shown below is attached to the sent message.



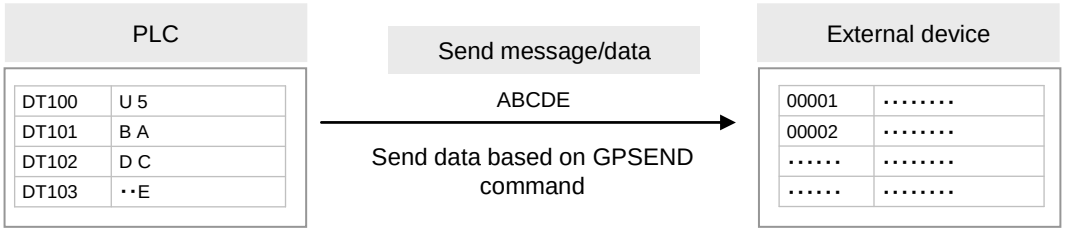
◆ **REFERENCE**

- **For details of setting screen for communication type, see 3.6 Setting of User Connection.**

7.2 Sending Operation

7.2.1 Overview of Sending Operation

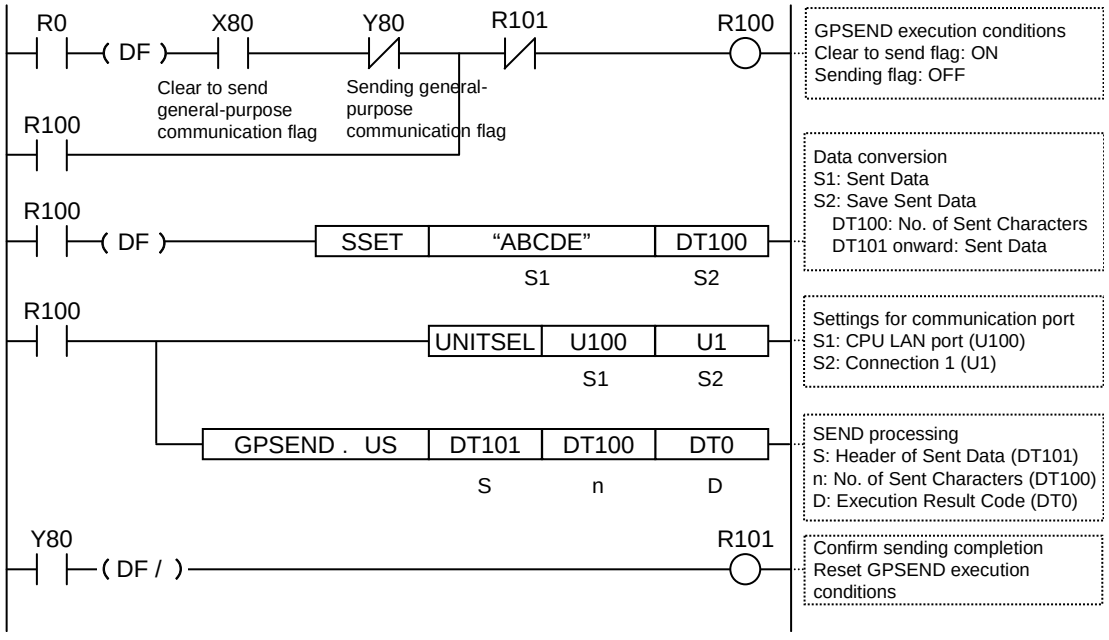
Sending in the general-purpose communication is performed by formulating a data table for sending on the given operation memory, and subsequently executing GPSEND command.



Note: The above figure indicates the data part. In communication via LAN, a header including size information of the sent data is added.

■ **Sample program**

- Confirm that Connection 1 is established in the general-purpose communication mode (X80), and that the general-purpose sending process is not in progress for the same port (Y80), and start up the sending program.
- In the SSET command, convert a given message into an ASCII text string, and specify the number of strings to be sent in the data register (DT100), and the message to be sent from the data register (DT101).
- In the UNITSEL command, specify the slot No. (LAN port: U100) and the connection No. (U1).
- In the GPSEND command, specify and execute the header of the table where the message to be sent is saved (DT101) and the No. of characters (DT100).



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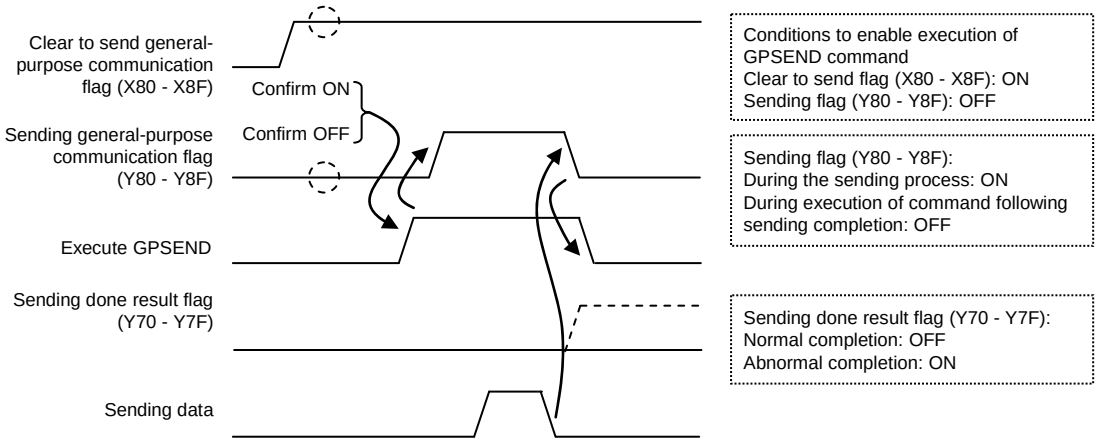
■ **Timing chart**

- Data in the table specified by GPSEND command are sent, in ascending order from lower bytes.
- While data are being sent, the sending general-purpose communication flag for the relevant connection (Y80 - Y8F) turns ON. The flag is turned OFF when sending is completed.
- The sending result (0: normal completion, 1: abnormal completion) is saved in the general-purpose communication sending result flag (Y70 - Y7F).


Clear to send general-purpose communication flag (X80 - X8F)
Confirm ON
Confirm OFF
Sending general-purpose communication flag (Y80 - Y8F)
Execute GPSEND
Sending done result flag (Y70 - Y7F)
Sending data
Conditions to enable execution of GPSEND command
Clear to send flag (X80 - X8F): ON
Sending flag (Y80 - Y8F): OFF
Sending flag (Y80 - Y8F):
During the sending process: ON
During execution of command following sending completion: OFF
Sending done result flag (Y70 - Y7F):
Normal completion: OFF
Abnormal completion: ON

■ **I/O Allocation**

I/O number	Name	Explanation
X80 - X8F	Clear to send general-purpose communication flag	When connection is ON in general-purpose communication, the flag is ON.
Y80 - Y8F	Sending general-purpose communication flag	Turns ON during sending data based on GPSEND command. Turns OFF when GPSEND command is executed for the next time following sending completion.
Y70 - Y7F	Sending done result flag	Reports completion result of sending data in general-purpose communication or master communication. (Normal completion: 0, Abnormal completion: 1)

(Note 1) Each contact is used for reading the operation status. Do not write over it with a user program.

◆ **KEY POINTS**

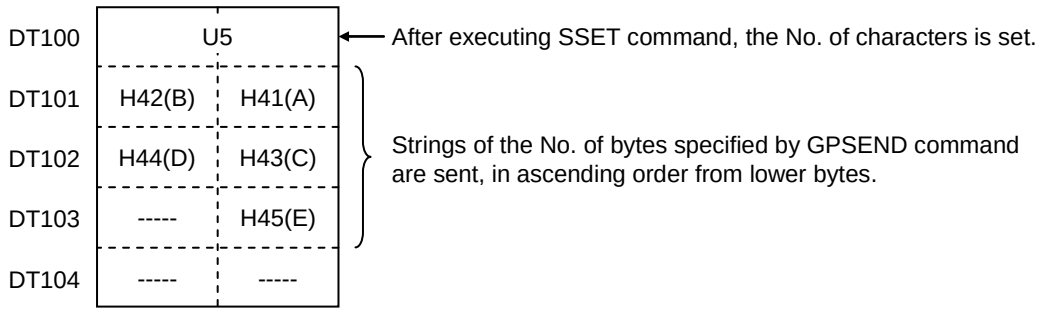
- **Specify the connection targeted for communication, using UNITSEL command immediately before GPSEND command.**
- **Maintain the ON conditions for GPSEND command until sending is completed and the sending general-purpose communication flag (Y80 - Y8F) turns OFF.**

7.2.2 Contents of Sent Data

Strings data sent by the GPSEND command are converted into ASCII text and saved in a given data register.

■ **Sent data table**

- Once the sent data are converted into strings data using the SSET command, the No. of characters is saved in the header area. The sent data are saved starting with lower bytes of the subsequent address.



◆ **KEY POINTS**

- **No start code or end code are attached to data that are sent from the FP7 CPU unit. When it is necessary to send a start code and an end code in accordance with the protocol of an external device, save them as a part of sent data.**
- **The data size that can be sent in a single transmission based on GPSEND command from the LAN port of the FP7 CPU unit is up to 16,384 bytes.**

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7.2.3 GPSEND (General-Purpose Communication Sending Command)

■ **Command format**

Setting item	Settings	Setting range
i	Specify the operation unit.	US / SS (Note 1)
S	Specify the header of the source node data area.	(Note 2)
n	Specify the No. of bytes of sent data.	1 - 16384 (Note 1) (Note 4)
D	Specify the device area in the source node to save the processing result code (one word).	(Note 3)

(Note 1) When a K constant (integer with a symbol) is specified for the No. of sent bytes [n], select SS for operation unit [i]. When a U constant (integer without a symbol) or an H constant (hexadecimal integer), select US for operation unit [i].

(Note 2) Devices that can be specified for S are: WX, WY, WR, WL, DT, LD.

(Note 3) Devices that can be specified for D are: WX, WY, WR, WL, DT, LD.
Once the sending process is completed, the sent bytes are saved. When an error occurs, "FFFFH" is saved.

(Note 4) This indicates a case where the sending port is a LAN port. When a dedicated header is attached, the size is up to 16,372 bytes.

◆ **KEY POINTS**

- **Specify the connection targeted for communication, using UNITSEL command immediately before GPSEND command.**
- **Maintain the ON conditions for GPSEND command until sending is completed and the sending general-purpose communication flag (Y80 - Y8F) turns OFF.**
- **When GPSEND command is executed for connection in progress, the sending flag and the sending result are updated.**
- **Confirm that the "clear to send general-purpose communication flag" (X80 - X8F) for the targeted connection has turned ON, and execute GPSEND command.**
- **GPSEND command cannot be used in an interrupt program.**

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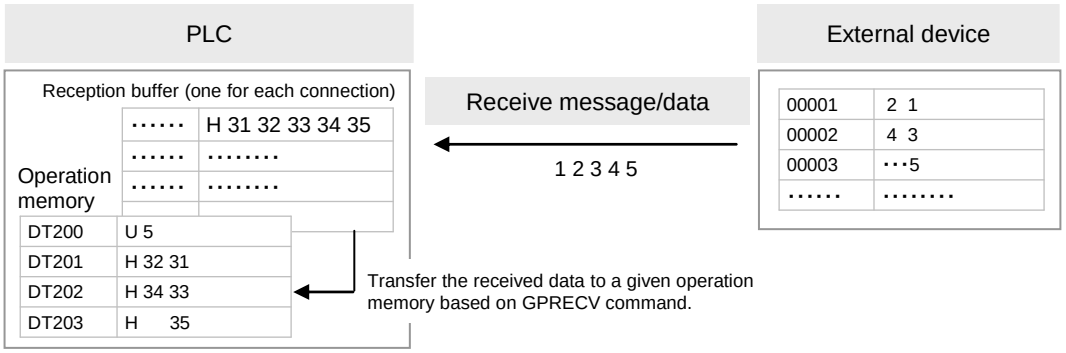
7.3 Receiving Operation

7.3.1 Overview of Receiving Operation

■ Procedures

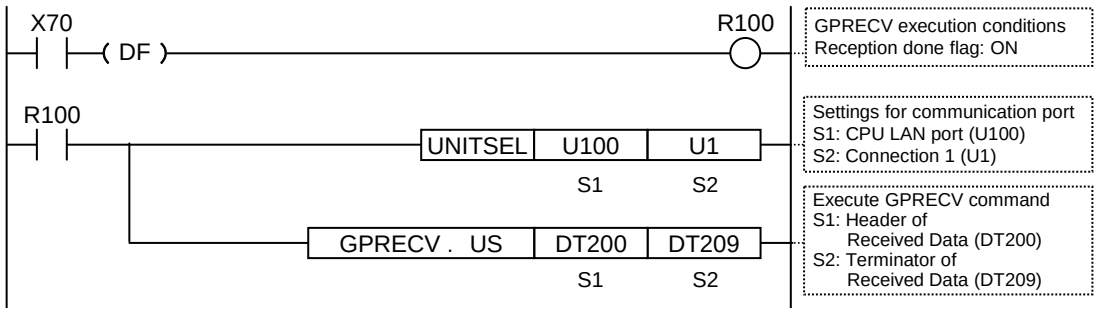
In the general-purpose communication mode, data received from the partner device are saved in the same reception buffer for each connection. When the GPRECV command is executed in a user program, data in the reception buffer can be copied into a given operation memory.



Note: The above figure indicates the data part. In communication via LAN, a header including size information of the sent data is added.

■ Sample program

- When the reception done flag (X70) for Connection 1 turns ON, the reception program is started up by the GPRECV command.
- In the UNITSEL command, specify the slot No. (LAN port: U100) and the connection No. (U1).
- In the GPRECV command, specify and execute the header of the data table where the received message is saved (DT200) and the final address (DT209).



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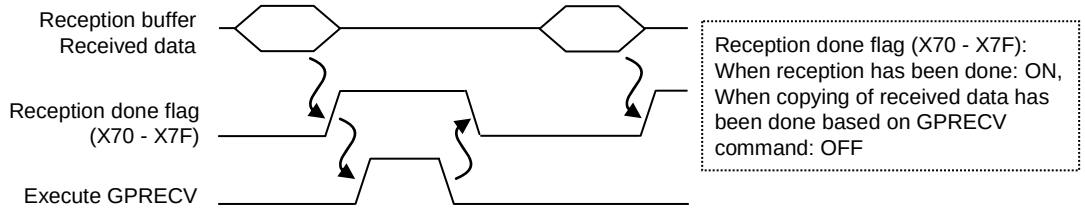
■ Timing chart

- Data received from an external device are saved in the reception buffer for each connection.
- When data are received, the “reception done” flag (X70 - X7F) turns ON.
- When the GPRECV command is executed, data are copied into the specified area, and the reception done flag (X70 - X7F) turns OFF. The reception done flag (X70 - X7F) turns OFF when the I/O refresh is executed at the beginning of the subsequent scans.

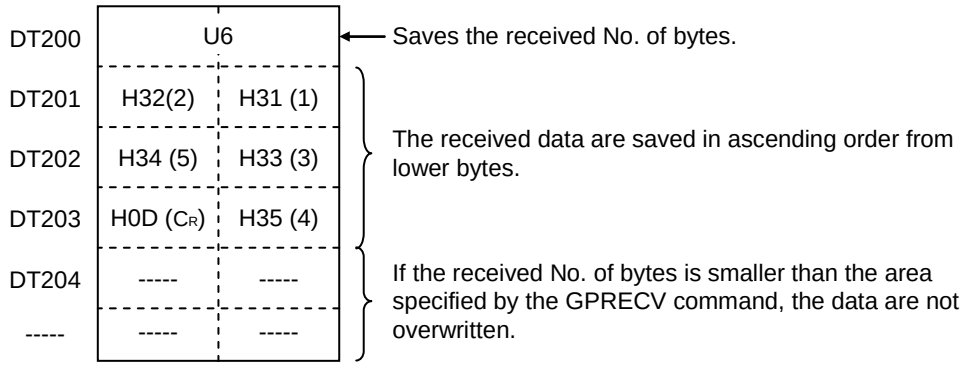

Reception buffer
Received data
Reception done flag
(X70 - X7F)
Execute GPRECV
Reception done flag (X70 - X7F):
When reception has been done: ON,
When copying of received data has been done based on GPRECV command: OFF

■ I/O number

I/O Allocation	Name	Explanation
X70 - X7F	General-purpose communication reception done flag	Turns ON when the receiving process is completed in the general-purpose communication mode.

■ Saving method for received data

When data are saved in a given data register from the reception buffer, based on GPRECV command, the data are saved in the following manner.



◆ KEY POINTS

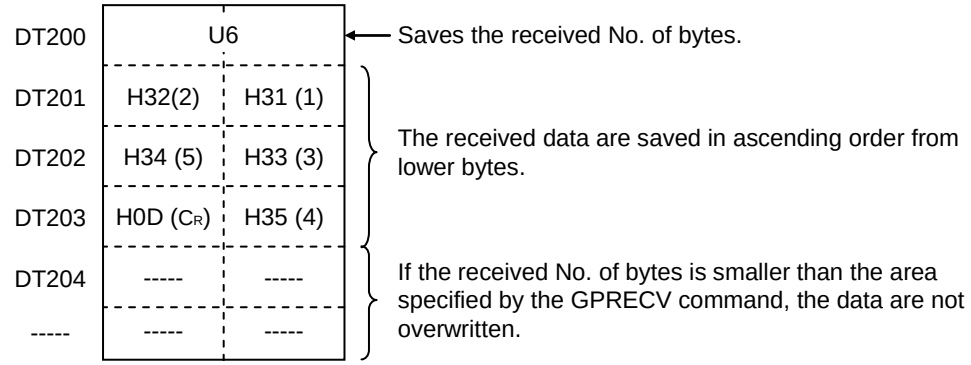
- **Specify the connection targeted for communication, using UNITSEL command immediately before GPSEND command.**
- **The data size that can be received in a single transmission based on GPRECV command from the LAN port of the FP7 CPU unit is up to 16,384 bytes.**

7.3.2 Contents of Received Data

When data are copied into a given data register , based on GPRECV command, the data are saved in the following manner.

■ **Saving method for received data**

When data are saved in a given data register from the reception buffer, based on GPRECV command, the data are saved in the following manner.



◆ **KEY POINTS**

- **When a start code and an end code are included in accordance with the communication format of an external device, they are saved as a part of received data in the operation memory. As necessary, insert a program for extracting the relevant data.**

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7.3.3 GPRECV (General-Purpose Communication Receiving Command)

■ **Command format**

Setting item	Settings	Setting range
i	Specify the operation unit.	US / SS
D1	Specify the initial address of the data area to save the received data.	(Note 1)
D2	Specify the final address of the data area to save the received data.	(Note 2)

(Note 1): Devices that can be specified for D1 are: WX, WY, WR, WL, DT, LD.
(Note 2): Devices that can be specified for D2 are: WX, WY, WR, WL, DT, LD.

◆ **KEY POINTS**

- **Specify the connection targeted for communication, using UNITSEL command immediately before GPRECV command.**
- **When the general-purpose communication reception done flag is ON for the targeted connection, execute GPRECV.**

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8

Specifications

8.1 Specifications of CPU Unit LAN Port Communication Function

■ **LAN port**

Items	Description
Interface	100BASE-TX / 10BASE-T
Baud rate	100 Mbps, 10 Mbps auto-negotiation (Note 1)
Transmission system	Baseband
Max. segment length	100 m (Note 2)
Communication cable	UTP (Category 5)
Max. distance between nodes	100BASE-TX: 2 segments
	10BASE-T: 5 segments
No. of nodes	254 units
Number of simultaneous connections	User connections: 16
	System connections: 4 (Note 3)
Communication protocol	TCP/IP, UDP/IP
DNS	Supports name server
DHCP	Automatic getting of IP address
FTP server	File transmission, server function, No. of users: 3
SNTP	Time synch function
Communication function	MEWTOCOL-DAT (master/slave), MEWTOCOL-COM (master/slave) MEWTOCOL7-COM (slave), MODBUS TCP (master/slave) general-purpose communication

(Note 1) Switching between different speeds is done automatically by auto negotiation function.

(Note 2) The standards cite 100 m as the maximum, but noise resistance measures such as attaching a ferrite core may be necessary in some cases, depending on the usage environment. Also, it is recommended to position a hub near the control board, and limit the length within 10 m

(Note 3) Used when connecting tool software via LAN.

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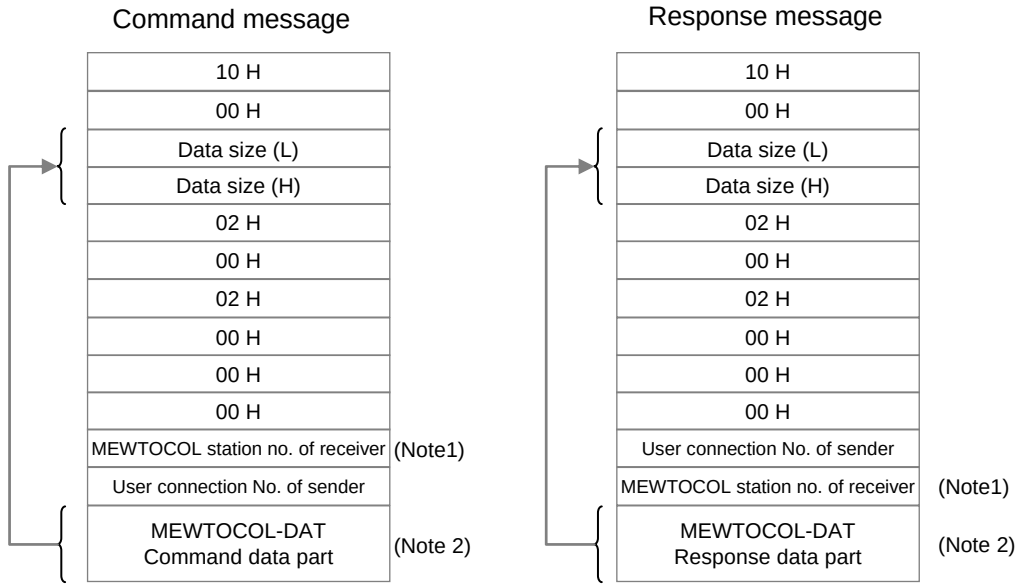
8.2 MEWTOCOL-DAT Format

8.2.1 MEWTOCOL-DAT Command Format in LAN Command Format

- In data sent/received in LAN communication, a header is attached to the MEWTOCOL-DAT command data part, or the MEWTOCOL-DAT response data part, as indicated in the data structure below.
- When the PLC side has the sending right, and executes the sending/receiving process, PLC automatically attaches these data when SEND/RECV command is executed. Therefore, it is not necessary to take account of these data in a user program.



(Note 1) MEWTOCOL station no. of the receiver varies based on settings for user connection information : MEWTOCOL communication type.

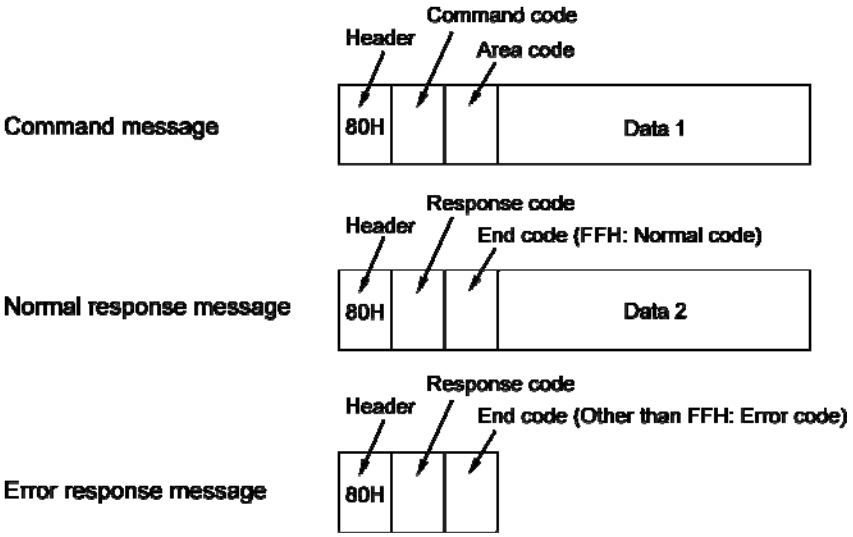
(Note 2) The maximum No. of bytes of the command response data part varies based on settings for user connection information : MEWTOCOL communication type.

Configuration MEWTOCOL communication type setting	MEWTOCOL station no. of sender	Max. bytes of the command data part and the response data part
Do not connect with FP2-ET-LAN	1	Max. 4084 bytes
Connect with FP2-ET-LAN	Station no. specified by the operand of SEND/RECV command	Max. 2048 bytes

8.2.2 MEWTOCOL-DAT Command/Response Format

■ **Format of command/response message**

Dedicated protocol by binary code in a dialog format



■ **Data contents**

(1) Header

Make sure to indicate "80H" in the beginning of the message.

(2) Command code and Response code

Make sure to indicate "80H" in the beginning of the message.

Type of instruction	Command code	Response code	Description
Write data area	50H	D0H	Writes data to a data area.
Read data area	51H	D1H	Reads the contents of a data area.
Write contact information	52H	D2H	Turns ON or OFF the specified 1-word contact.
Read contact information	53H	D3H	Read ON/OFF status of contact in the specified 1-word contact.

(3) Data

The content of this varies depending on the type of command. The content should be noted following the fixed formula for the particular command.

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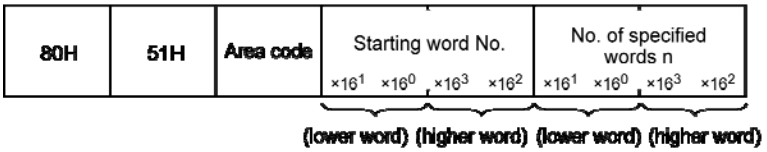
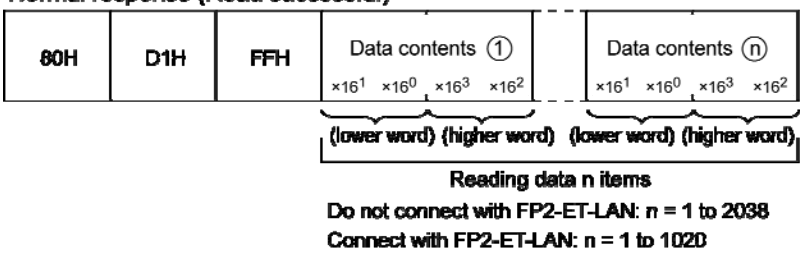
■ **Example of command/response message**

Below is shown an example of "Read data area" (command code 51H).

Command



Normal response (Read successful)


80H
D1H
FFH
Data contents ①
×16¹ ×16⁰ ×16³ ×16²
Data contents ⓝ
×16¹ ×16⁰ ×16³ ×16²
(lower word) (higher word) (lower word) (higher word)
Reading data n items
Do not connect with FP2-ET-LAN: n = 1 to 2038
Connect with FP2-ET-LAN: n = 1 to 1020

Error response (Read error)

8.3 MEWTOCOL-COM Format

8.3.1 MEWTOCOL-COM Command Format in LAN Communication

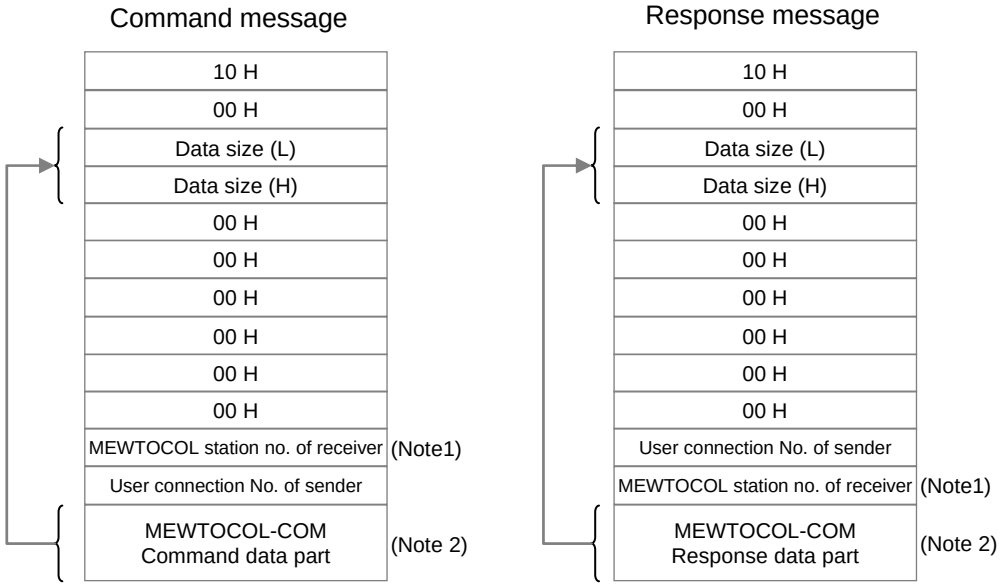
■ Format of command/response message

- Data to be sent/received in LAN communication vary based on settings for user connection information: MEWTOCOL communication type.

Configuration MEWTOCOL communication type setting	Format of command and response
Do not connect with FP2-ET-LAN	Only send the MEWTOCOL-COM command data part, or the MEWTOCOL-COM response data part, and no header is attached.
Connect with FP2-ET-LAN	A header is attached to the MEWTOCOL-COM command data part, or the MEWTOCOL-COM response data part, as indicated in the data structure below.

- When the PLC side has the sending right, and executes the sending/receiving process, PLC automatically attaches these data when SEND/RECV command is executed. Therefore, it is not necessary to take account of these data in a user program.

■ Message format in the case of "Connect with FP2-ET-LAN"



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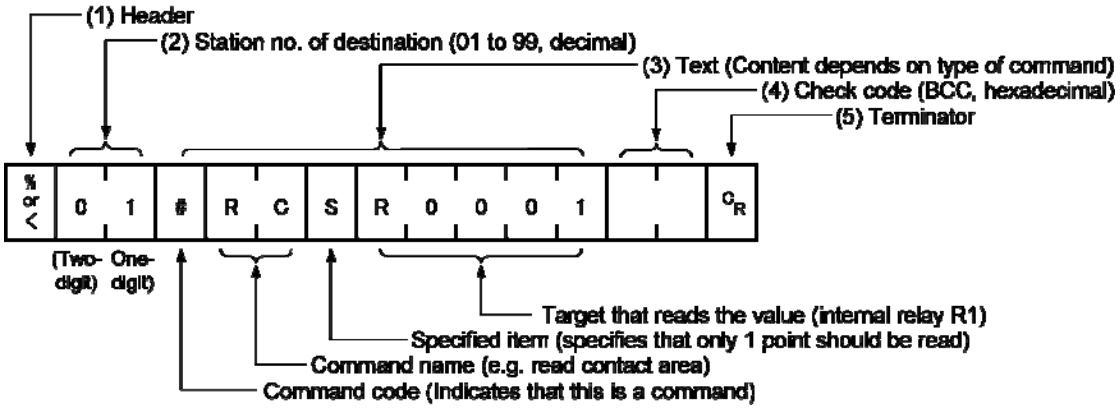
8.3.2 MEWTOCOL-COM Command Format

■ **Command message**


(1) Header
(2) Station no. of destination (01 to 99, decimal)
(3) Text (Content depends on type of command)
(4) Check code (BCC, hexadecimal)
(5) Terminator
% or <
0 1
#
R C
S
R 0 0 0 1
CR
(Two-digit)
One-digit)
Target that reads the value (internal relay R1)
Specified item (specifies that only 1 point should be read)
Command name (e.g. read contact area)
Command code (Indicates that this is a command)

(1) Header (start code)

Commands must always have a “%” (ASCII code: H25) or a “<” (ASCII code: H3C) at the beginning of a message.

(2) Station no.

- The station no. of the PLC to which you want to send the command must be specified. The station no. of the PLC is specified by the system register. In the case of the FP7 CPU unit, the station no. is specified in the FPWIN GR7 configuration menu.
- When the receiver is FP7, specify "01" (ASCII code: H3031). The receiver to which you want to connect is specified by IP address.

(3) Text

The content of this varies depending on the type of command. The content should be noted in all upper-case characters, following the fixed formula.

(4) Check code

- This is a BCC (block check code) for error detection using horizontal parity. The BCC should be created so that it targets all of the text data from the header to the last text character.
- The BCC starts from the header and checks each character in sequence, using the exclusive OR operation, and replaces the final result with character text. It is normally part of the calculation program and is created automatically.
- By entering "**" (ASCII code: H2A2A) instead of BCC, you can omit BCC.

(5) Terminator (end code)

Messages must always end with a “CR” (ASCII code: H0D).

◆ NOTES

- **The method for writing text segments in the message varies depending on the type of command.**
- **When the message to be sent contains a large number of characters, send the command divided in several times.**
- **When the message contains a large number of characters, the response is sent divided in several times.**

◆ KEY POINTS

- **An expansion header "<" is supported to send single frames of up to 2048 characters as well as general "%".**

Type of header	No. of characters that can be sent in 1 frame
%	Max. 118 characters
<	Max. 2048 characters

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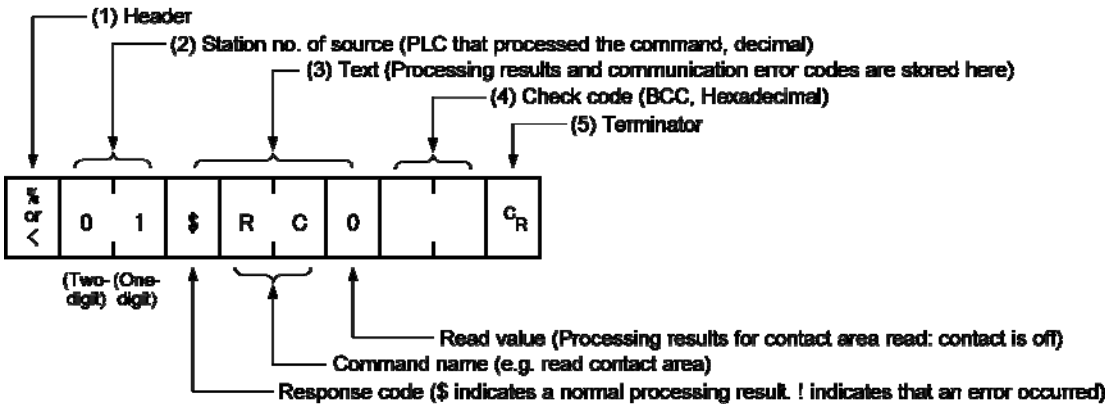
8.3.3 MEWTOCOL-COM Response Format

■ **Response message**

After PLC receives a command, it returns the processing result.


(1) Header
(2) Station no. of source (PLC that processed the command, decimal)
(3) Text (Processing results and communication error codes are stored here)
(4) Check code (BCC, Hexadecimal)
(5) Terminator
% or <
0
1
$
R
C
0
CR
(Two-digit)
(One-digit)
Read value (Processing results for contact area read: contact is off)
Command name (e.g. read contact area)
Response code ($ indicates a normal processing result. ! indicates that an error occurred)

(1) Header (start code)

- A “%” (ASCII code: H25) or “<” (ASCII code: H3C) must be at the beginning of a message.
- The response must start with the same header that was at the beginning of the command.

(2) Station no.

This is the station no. of the PLC that processed the command.

(3) Text

The content of this varies depending on the type of command. If the processing is not completed successfully, an error code will be stored here, so that the content of the error can be checked.

(4) Check code

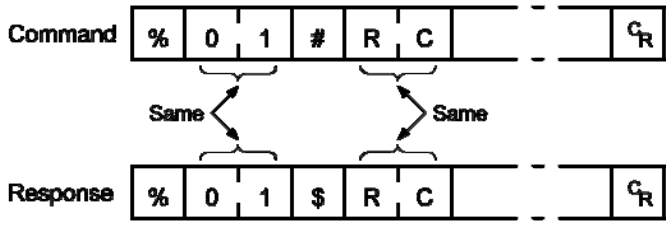
- This is a BCC (block check code) for error detection using horizontal parity.
- The BCC starts from the header and checks each character in sequence, using the exclusive OR operation, and replaces the final result with ASCII codes.

(5) Terminator (end code)

The message should end with "CR" (ASCII code: H0D).

◆ **NOTES**

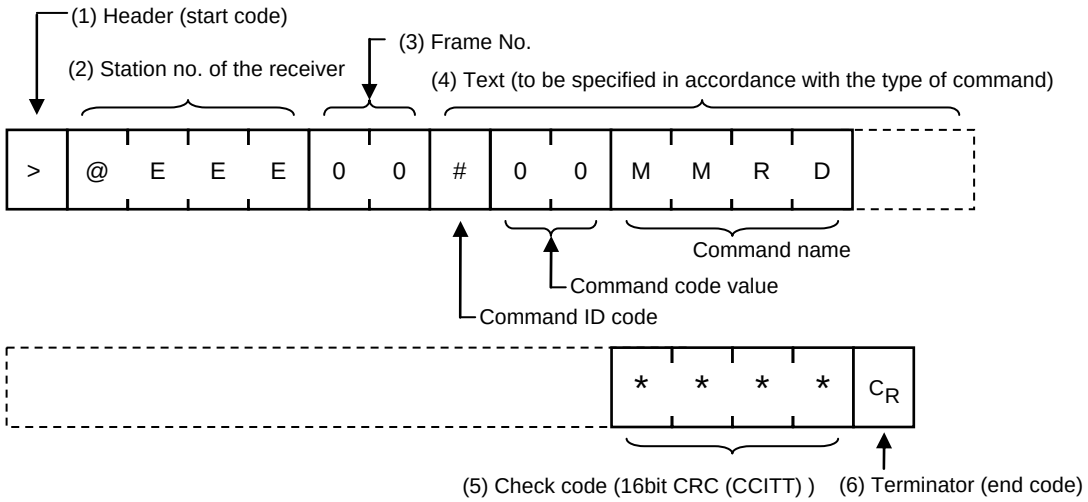
- **If no response is returned, the communication format may not be correct, or the command may not have arrived at the PLC, or the PLC may not be functioning. Check if the specified connection is ON, or if the connection information setting is correct.**
- **If the response contains an "!" instead of a "$", the command was not processed successfully. The response will contain a communication error code. Check the meaning of the error code.**
- **Station no. and command name are always identical in a command and its corresponding response (see below). This makes the correspondence between a command and a response clear.**



8.4 MEWTOCOL7-COM Format

8.4.1 MEWTOCOL7-COM Command Format

■ **Command message**


(1) Header (start code)
(2) Station no. of the receiver
(3) Frame No.
(4) Text (to be specified in accordance with the type of command)
> @ E E E 0 0 # 0 0 M M R D
Command name
Command code value
Command ID code
* * * * CR
(5) Check code (16bit CRC (CCITT))
(6) Terminator (end code)

(1) Header (start code)

A “>” (ASCII code: H3E) must be at the beginning of a message.

(2) Station no.

- The station no. of the receiving PLC to which you want to send the command must be specified with "@ and three digits". The station no. of the PLC is specified by the system register. In the case of the FP7 CPU unit, the station no. is specified in the FPWIN GR7 configuration menu.
- When the receiver is FP7, specify "01" (ASCII code: H3031). The receiver to which you want to connect is specified by IP address.

(3) Frame No.

This indicates the sending frame No. Make sure to use consecutive frame numbers.

E.g. Commands for multiple frames

>@EEE00#00MMRDD001G0DT0000000001000****CR

>@EEE01****& CR

* Make sure to use consecutive values for frame numbers. The usable number range is from 00 to FF. After FF, return to 00.

(4) Text

The content of this varies depending on the type of command. The content should be noted in all upper-case characters, following the fixed formula for the particular command.

(5) Check code

- This is a CRC (Cyclic Redundancy Check) to detect errors using a generating polynomial of hamming codes.
- The CRC should be created so that it targets all of the text data from the header to the last text character.
- CRC is a value given by replacing the result of calculation by CRC-16-CCITT with ASCII codes. It is normally part of the calculation program and is created automatically.

(6) Terminator (end code)

Messages must always end with a “CR” (ASCII code: H0D).

◆ KEY POINTS

- **The method for writing text segments in the message varies depending on the type of command.**
- **When the message to be sent contains a large number of characters, send the command divided in several times.**
- **When the message contains a large number of characters, the response is sent divided in several times.**
- **In MEWTOCOL7 command, up to 4096 characters can be sent/received in a single frame.**

Type of header	No. of characters that can be sent in 1 frame
>	Max. 4096 characters

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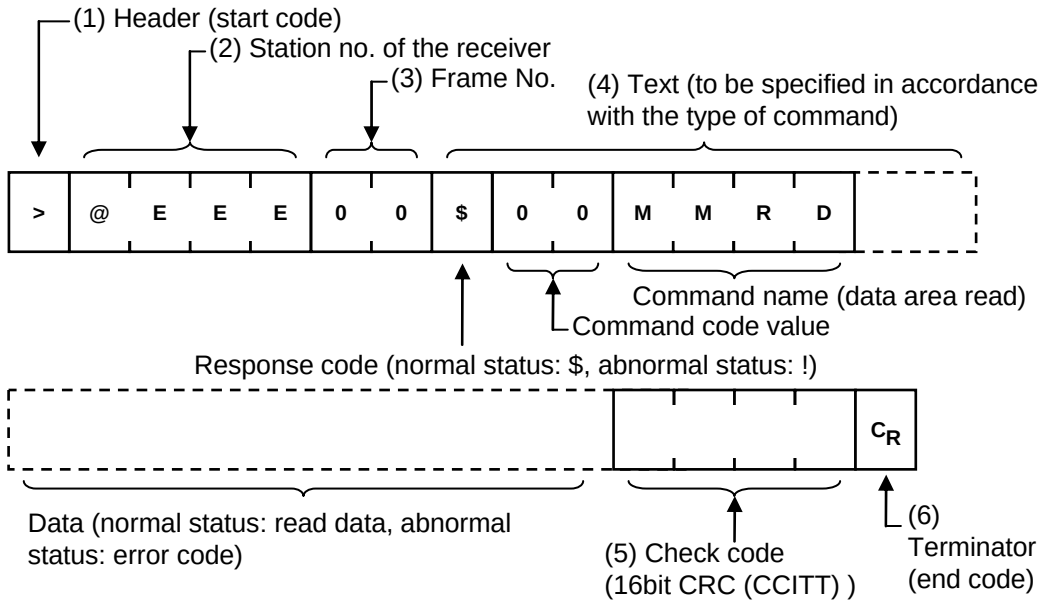
8.4.2 MEWTOCOL7 Response Format

■ **Response message**


(1) Header (start code)
(2) Station no. of the receiver
(3) Frame No.
(4) Text (to be specified in accordance with the type of command)
> @ E E E 0 0 $ 0 0 M M R D
Command name (data area read)
Command code value
Response code (normal status: $, abnormal status: !)
CR
Data (normal status: read data, abnormal status: error code)
(5) Check code (16bit CRC (CCITT))
(6) Terminator (end code)

(1) Header (start code)

- A ">" (ASCII code: H3E) must be at the beginning of a message.
- The response must start with the same header (start code).

(2) Station no.

This is the station no. of the PLC that processed the command.

(3) Frame No.

This is the frame number where the command was processed.

(4) Text

The content of this varies depending on the type of command. If the processing is not completed successfully, an error code will be stored here, so that the content of the error can be checked.

(5) Check code

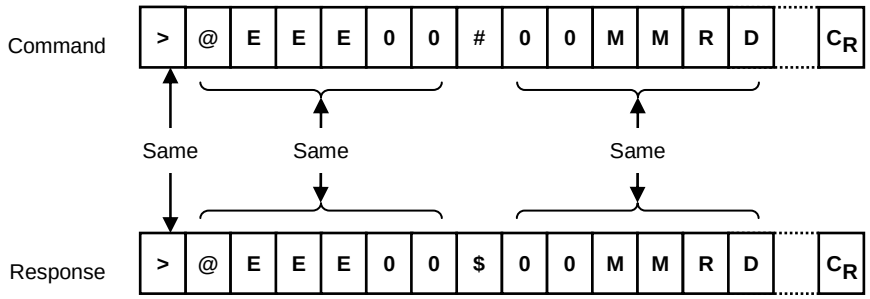
- This is a CRC (Cyclic Redundancy Check) to detect errors using a generating polynomial of hamming codes.
- The CRC should be created so that it targets all of the text data from the header to the last text character.
- CRC is a value given by replacing the result of calculation by CRC-16-CCITT with character text. It is normally part of the calculation program and is created automatically.

(6) Terminator (end code)

The message should end with "CR" (ASCII code: H0D).

◆ **NOTES**

- **If no response is returned, the communication format may not be correct, or the command may not have arrived at the PLC, or the PLC may not be functioning. Check if the specified connection is ON, or if the connection information setting is correct.**
- **If the response contains an "!" instead of a "$", the command was not processed successfully. The response will contain a communication error code. Check the meaning of the error code.**
- **Station no. and command name are always identical in a command and its corresponding response (see below). This makes the correspondence between a command and a response clear.**



Record of changes

Manual No.	Date	Record of Changes
WUME-FP7LAN-01	Mar.2013	First Edition